Road & Bridge Design Publications

Monthly Update – February 2016

Revisions for the month of **February** are listed and displayed below. New special details will be included in projects submitted for the **May** letting as is stated on the special detail index sheets. E-mail Road related questions on these changes to MDOT-Road-Design-Standards@michigan.gov. E-mail Bridge related questions to MDOT-Bridge-Design-Standards@michigan.gov.

Special Details

R-60-J: Guardrail Types A, B, BD, T, TD, MGS-8. MGS-8D, MGS-0, & MGS-0D: Added details for the Midwest Guardrail System (MGS) and for connecting MGS to existing guardrail. Added the option of W6x8.5 steel posts (versus W6x9) and an optional galvanized hole in the steel post for lifting. Also updated the first note in the note section regarding standardized highway barrier hardware.

R-61-H: Guardrail Approach Terminal Types 1B & 1T: Added the X-Lite-Flared guardrail approach terminal. Also, added the MGS-8 & MGS-0 to the guardrail types which connect to the Type 1B terminals and added notes referencing R-60-series for details regarding guardrail layout to connect MGS guardrail to the Type 1T ending.

R-62-H: Guardrail Approach Terminal Types 2B & 2T: Added the X-Lite-Tangent-50 guardrail approach terminal. Also, added the MGS-8 & MGS-0 to the guardrail types which connect to the Type 2B terminals and added notes referencing R-60-series for details regarding guardrail layout to connect MGS guardrail to the Type 2T ending.

R-66-E: Guardrail Departing Terminal Types B, D, & MGS: Added guardrail departing terminal Type MGS and a detail for the MGS post.

R-67-G: Guardrail Anchorage, Bridge Details: Added the MGS-8 & MGS-0 to the guardrail types which connect to the Guardrail Anchorage, Bridge Details and added notes referencing R-60-series for details regarding guardrail layout to connect MGS guardrail to the anchorage.

R-83-C: Utility Trenches: Added an envelope of Class II AA around the geotextile wrapped underdrains in details C1, C2, D1, & D2.

B-22-E: Bridge Railing, Thrie Beam Retrofit (R4): Added the MGS-8 & MGS-0 to the guardrail types which connect to the Bridge Railing Thrie Beam Retrofit.

B-23-F: Bridge Railing, Thrie Beam Retrofit (Open Parapet): Added the MGS-8 & MGS-0 to the guardrail types which connect to the Bridge Railing Thrie Beam Retrofit.

Road & Bridge Design Publications

Monthly Update – February 2016

B-101-G: Drain Casting Assembly Details**:** Updated insert types and requirement for inserts to be electroplate galvanized in accordance with ASTM B633, Service Condition 4.

EJ3AB & EJ4O: Expansion Joint Details**:** Updated Joint Types (added Onflex 40 SSA on EJ3AB). Updated expansion joint device sections with a more representative section of the most common devices used. Updated expansion joint device installation location to ¼" to ⅜" below the adjacent deck elevation in section and Fabrication and Installation notes and finishing of radius/bevel at installation location. Added note to remove shipping bolts prior to placement of (elastomeric) concrete.

Road Design Manual

7.01.12: Types of Guardrail Used in Michigan: Added descriptions for the MGS-8, MGS-8D, MGS-0, & MGS-0D guardrail systems.

7.01.15: Guardrail Terminals: Added a description for Guardrail Departing Terminal, Type MGS and added MGS guardrail to the guardrail types which connect to Guardrail Approach Terminal Type 1B.

7.01.16: Guardrail Attachment to Bridges & Walls: Added MGS-8 & MGS-0 to the types of guardrail which connect to Guardrail Anchorage, Bridge. Added the 2-Tube, 4-Tube, and aesthetic parapet tube railings to Guardrail Anchorage Bridge Details T-1, T-2, & T-5 to match what has been listed in Standard Plan R-67-series. Also, corrected a typo in the section dealing with Guardrail Anchorage Bridge, Type T-3. (Type T guardrail revised to Type B.)

9.04.09: Lighting Project-Energy Rebate Procedure: Added a new section which introduces a new procedure for applying for lighting energy rebates from energy companies.

Bridge Design Manual

7.02.24 B.2. (LFD & LRFD)**:** Updated expansion joint device installation location to ¼" to ⅜" below the adjacent deck elevation and the requirement to fill out and place in the project file Form 0304 (Proprietary Item Certification (PIC) and Public Interest Finding (PIF)) for Delcrete Elastomeric Concrete used with devices on EJ4 Sheet.

8.07.04 C. & X. (LFD & LRFD)**:** Updated material (coating) properties for inserts (coil or ferrule) which must be electroplate galvanized in accordance with ASTM B633, Service Condition 4.

Road & Bridge Design Publications

Monthly Update – February 2016

8.09.04 K. (LFD & LRFD)**:** Added use statement to note. Critical with blast cleaning and coating structural steel.

Bridge Design Guides

8.06.02 & 8.06.02A**:** Added a J-Cope hole alternate for stiffeners and weld designation/sizes.

8.06.03**:** Updated weld designation to complete penetration groove weld, finish flush. Also updated note to checker.

Updates to MDOT Cell Library, Bridge Auto Draw Program, etc., may be required in tandem with some of this month's updates. Until such updates to automated tools can be made, it is the designer's/detailer's responsibility to manually incorporate any necessary revisions to notes and plan details to reflect these revisions.

Index to Special Details
2-16-2016

⑥

SPECIAL DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
21	2	GUARDRAIL AT INTERSECTIONS	5-24-01
24	5	GUARDRAIL ANCHORED IN BACK SLOPE TYPES 4B & 4T	7-22-02
99	2	CHAIN LINK FENCE WITH WIRE ROPE	9-22-14
R-1-G	9	DRAINAGE STRUCTURES	7-28-15
R-53-A	22	TEMPORARY CONCRETE BARRIER LIMITED DEFLECTION	8-14-15
*R-60-J	16	GUARDRAIL TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0, & MGS-0D	2-1-16
*R-61-H	19	GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SKT, FLEAT, & X-Lite)	2-9-16
*R-62-H	10	GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-Lite)	2-4-16
*R-66-E	4	GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS	1-28-16
*R-67-G	7	GUARDRAIL ANCHORAGE, BRIDGE, DETAILS	2-8-16
*R-83-C	5	UTILITY TRENCHES	2-8-16
R-126-I	5	PLACEMENT OF TEMPORARY CONCRETE & STEEL BARRIER	8-25-15

*** Denotes New or Revised Special Detail to be included in projects for (beginning with) the May letting.**

Note: Former Standard Plans IV-87, IV-89, IV-90, and IV-91 Series, used for building cast-in-place concrete head walls for elliptical and circular pipe culverts, are now being replaced with plans that detail each specific size. The Municipal Utilities Unit will provide these full sized special details for inclusion in construction plans for MDOT jobs. To assure prompt delivery, requests ***must*** be made in advance.

Former Standard Plans IV-93 and IV-94 series have been replaced with precast concrete box & three-sided culverts as per the 2012 Standard Specifications for Construction.

Index to Bridge Detail Sheets

2-16-2016

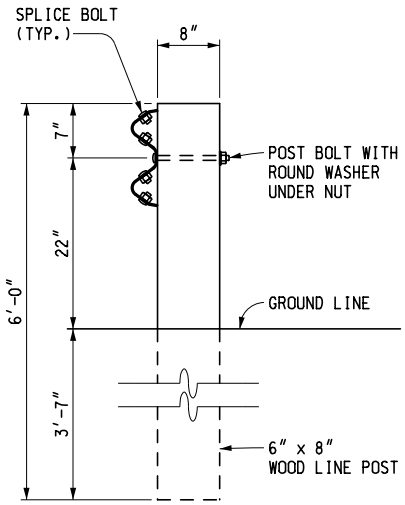
⑦

DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
*B-22-E	4	BRIDGE RAILING, THRIE BEAM RETROFIT (R4 TYPE RAILING)	2-4-16
*B-23-F	4	BRIDGE RAILING, THRIE BEAM RETROFIT (OPEN PARAPET RAILING)	2-5-16
*B-101-G	2	DRAIN CASTING ASSEMBLEY DETAILS	2-8-16
*EJ3AB	1 or 2	EXPANSION JOINT DETAILS	2-10-16
*EJ4O	1 or 2	EXPANSION JOINT DETAILS	2-10-16
PC-2G	1	70" PRESTRESSED CONCRETE I-BEAM DETAILS	3-31-06
PC-4E	1	PRESTRESSED CONCRETE 1800 BEAM DETAILS	3-31-06
PC-1L	1	PRESTRESSED CONCRETE I-BEAM DETAILS	7-12-06

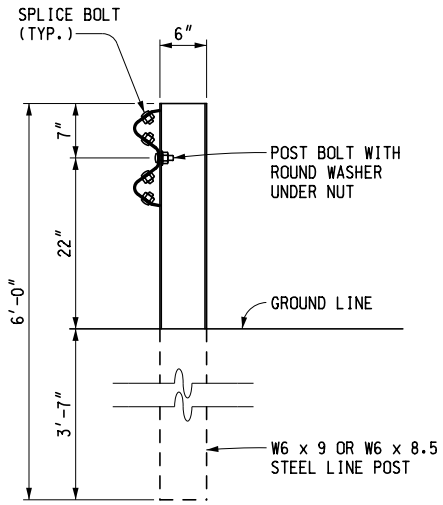
*** Denotes New or Revised Special Detail to be included in projects for (beginning with) the May letting.**

Note: Details EJ3AA & EJ4N are interactive, i.e. designers and detailers choose details based upon railing type and angle of crossing. Place all details appropriate for the project, structure specific information, and the Expansion Joint Device quantity on the sheet. The sheet shall then be added to the plans as a normal plan sheet.

Detail PC-1L, PC-2G and PC-4E shall have structure specific information and quantities added to the sheet. The sheet shall then be added to the plans as a normal plan sheet.



WOOD POST



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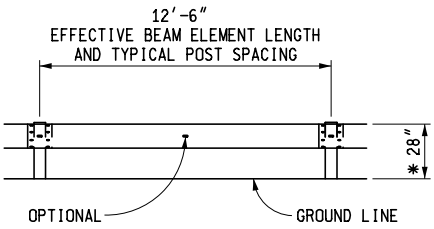
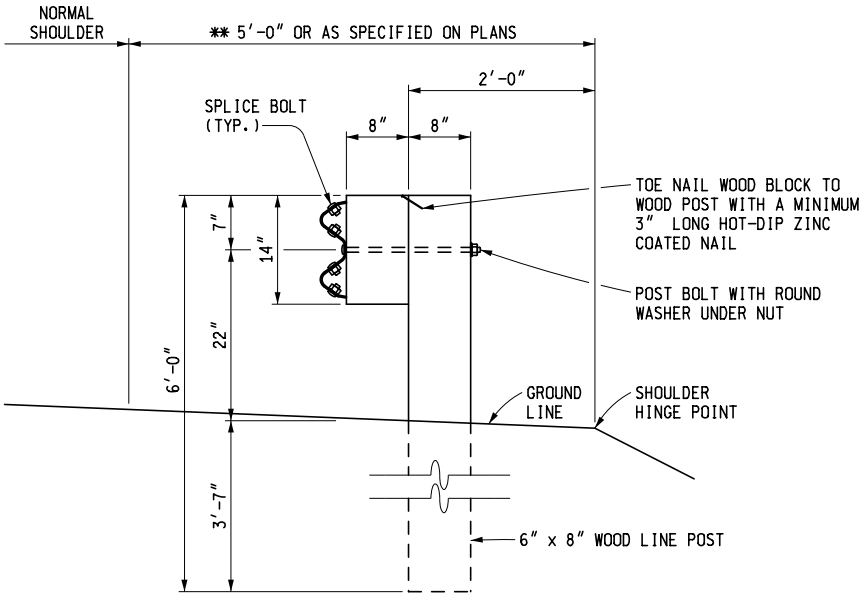


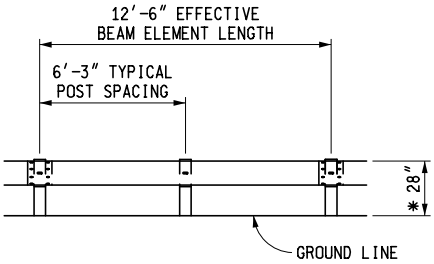
ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE A



** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12′, USE 3′-0″.



ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE B
(WOOD POST)

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

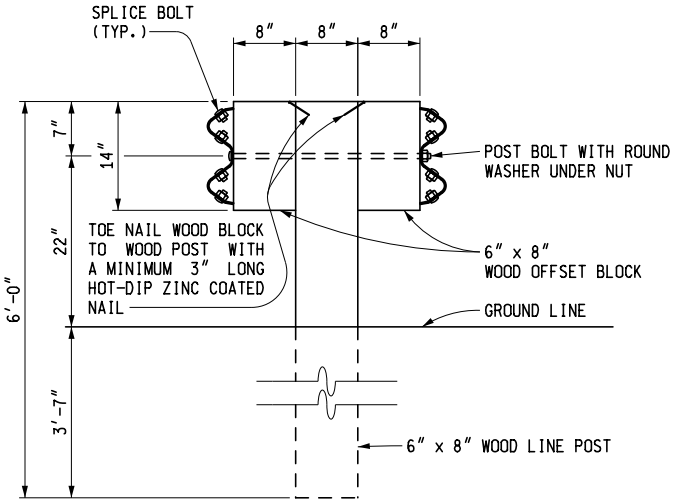
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

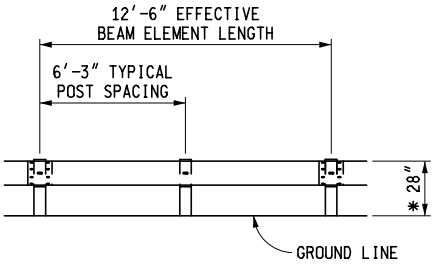
APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 1 OF 16

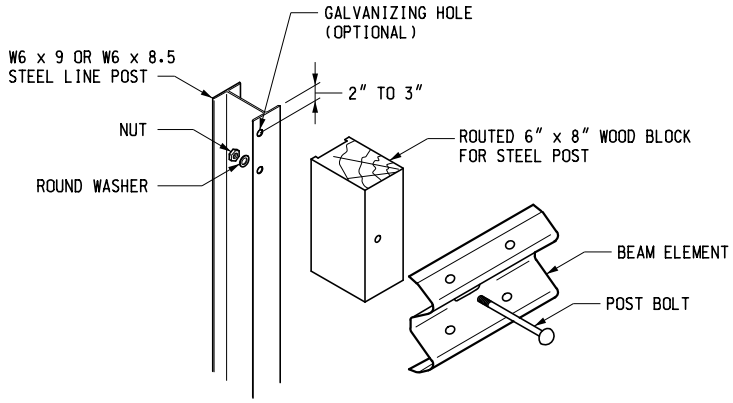


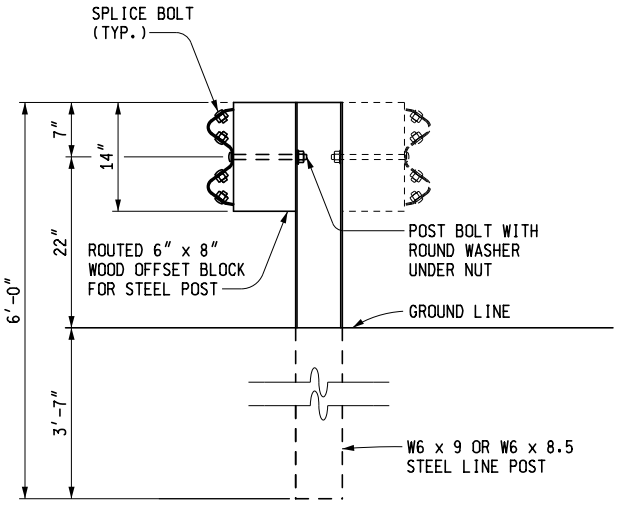


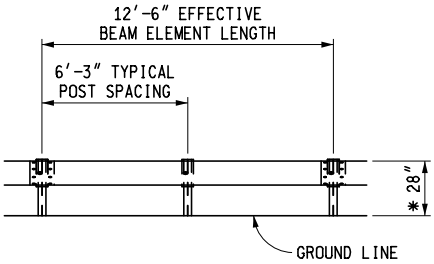
ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE BD
(WOOD POST)







ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

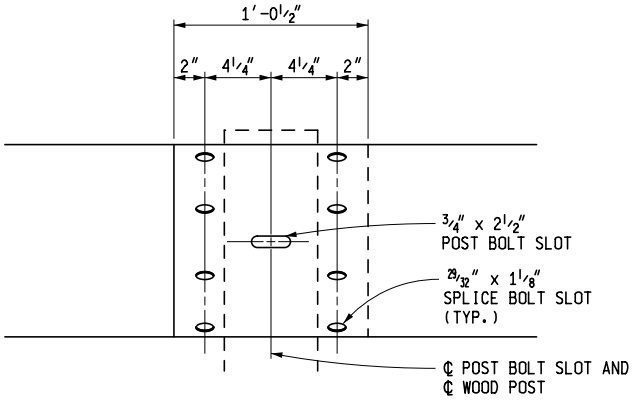
GUARDRAIL, TYPE B (OR BD)
(STEEL POST)

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 2 OF 16



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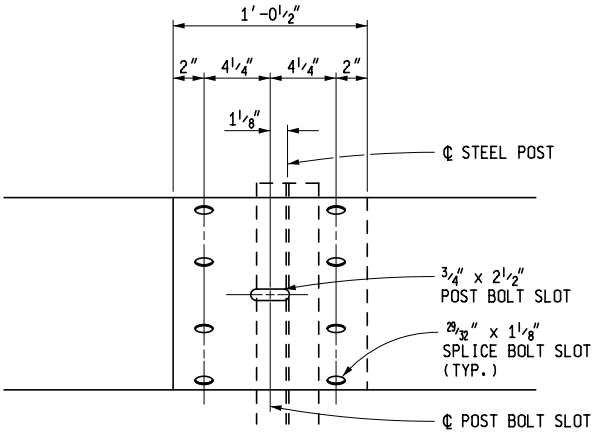
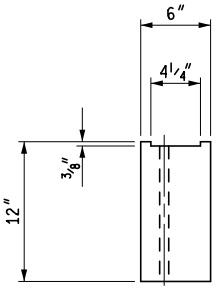


STEEL POST

BEAM ELEMENT SPLICE DETAILS



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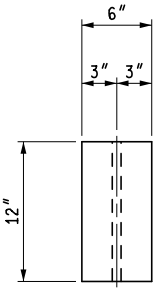

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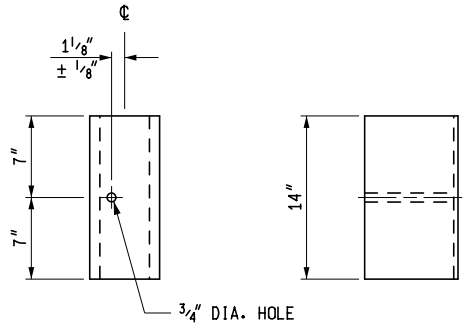
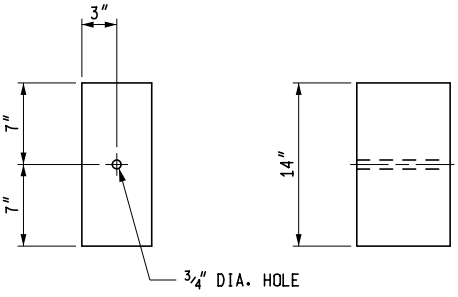


FRONT SIDE

FOR USE ON STEEL POSTS



FRONT SIDE

FOR USE ON WOOD POSTS

(SEE NOTES ON SHEET 16 OF 16)

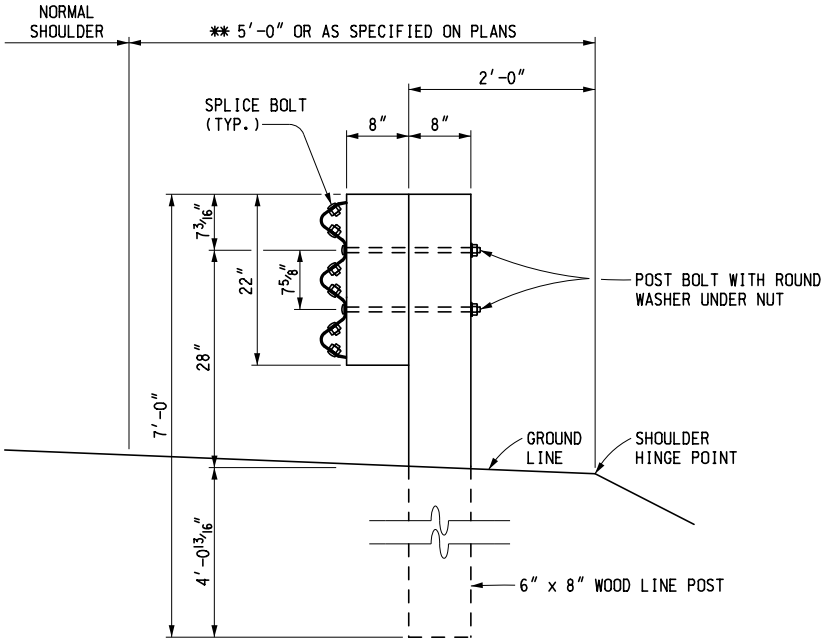
WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE B AND TYPE BD

MICHIGAN DEPARTMENT OF TRANSPORTATION

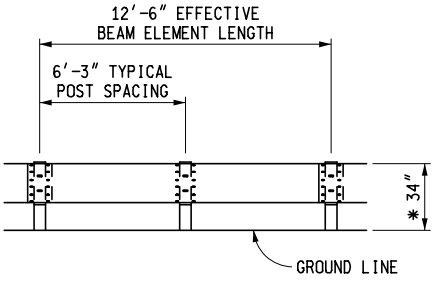
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 3 OF 16



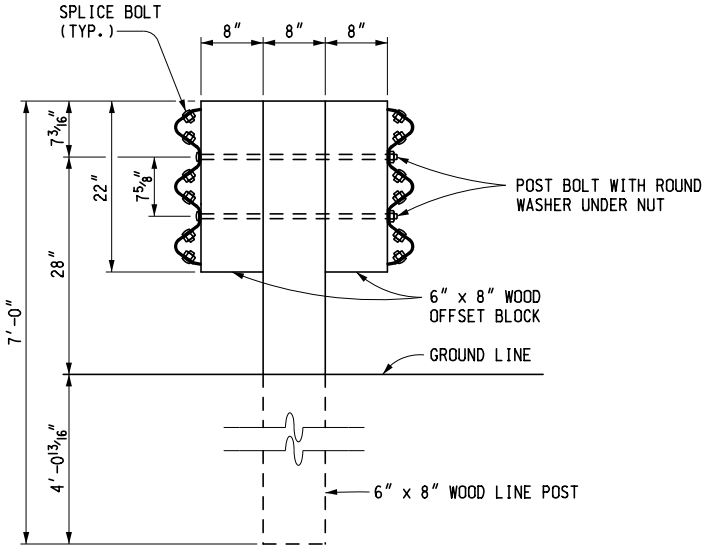
** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12′, USE 3′-0″.

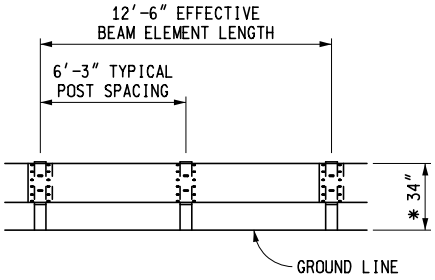


ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE T
(WOOD POST)





ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

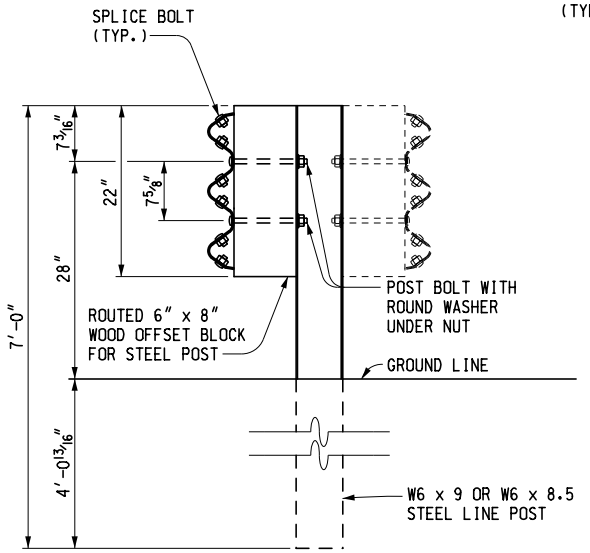
GUARDRAIL, TYPE TD
(WOOD POST)

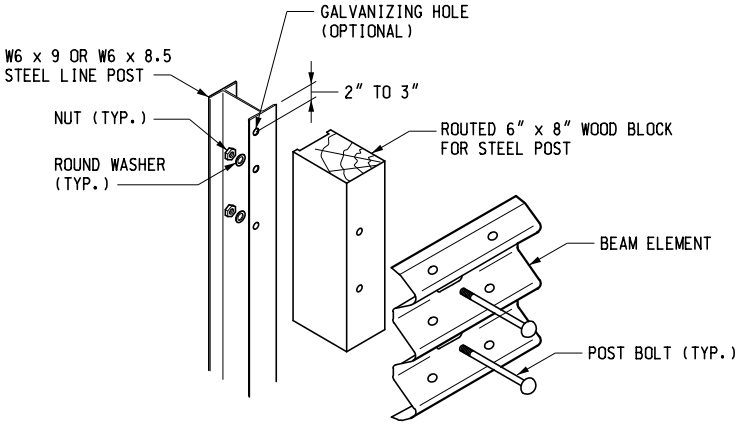
MICHIGAN DEPARTMENT OF TRANSPORTATION

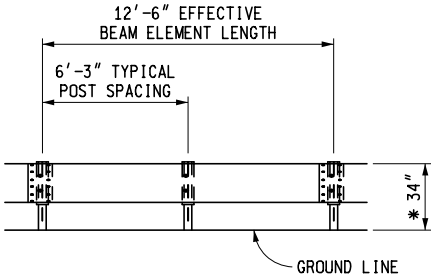
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 4 OF 16



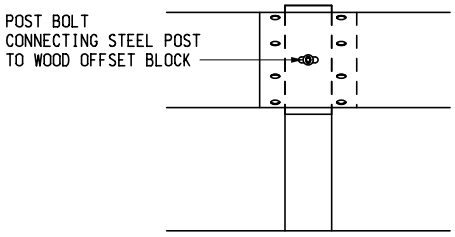




ELEVATION SHOWING POST SPACING

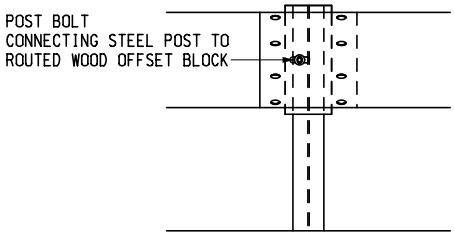
* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE T OR TD
(STEEL POST)



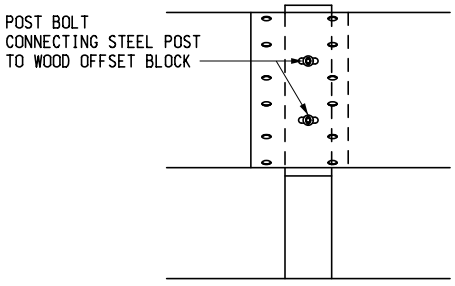
GUARDRAIL, TYPE B

WOOD POST



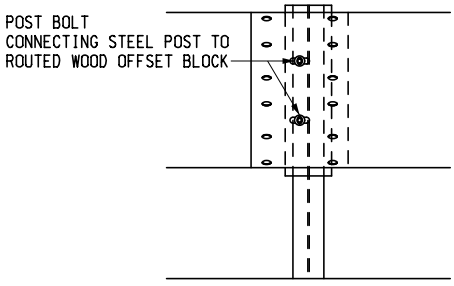
GUARDRAIL, TYPE B

STEEL POST



GUARDRAIL, TYPE T

WOOD POST



GUARDRAIL, TYPE T

STEEL POST

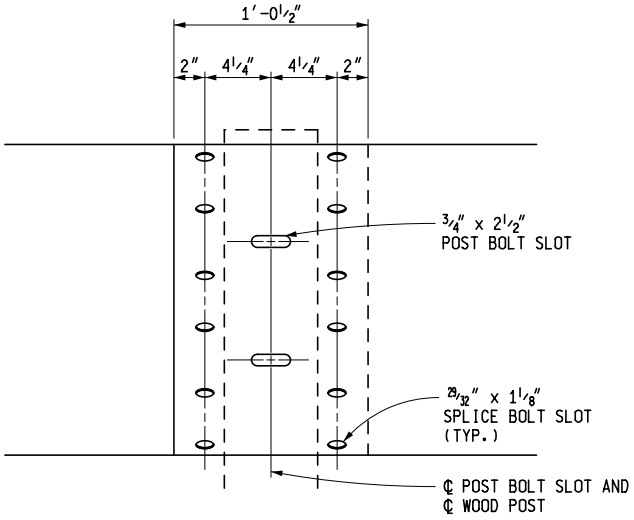
BLOCK AND POST CONNECTION DETAILS

MICHIGAN DEPARTMENT OF TRANSPORTATION

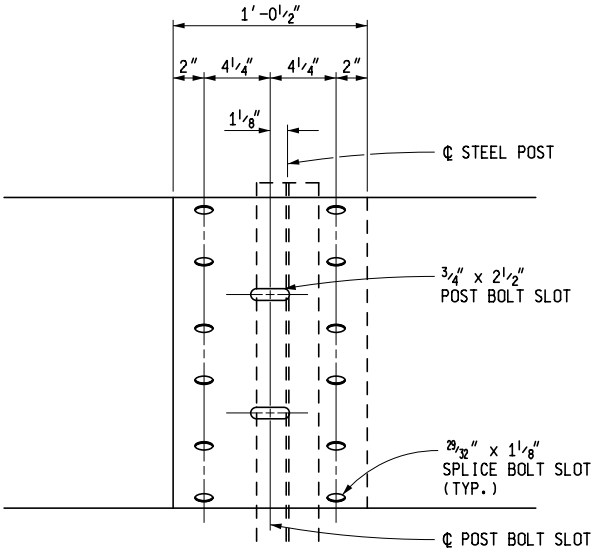
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 5 OF 16

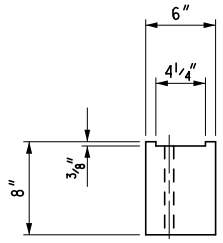


WOOD POST



STEEL POST

THRIE BEAM ELEMENT SPLICE DETAILS



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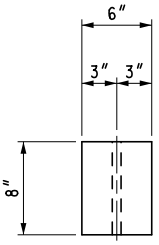

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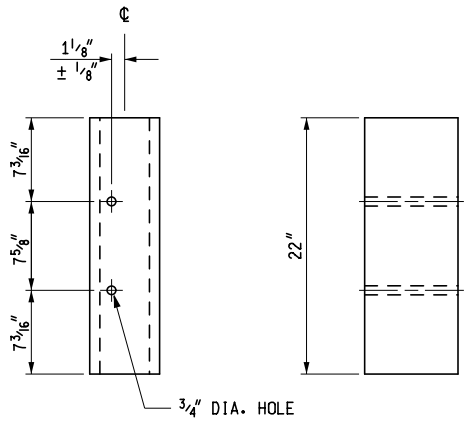
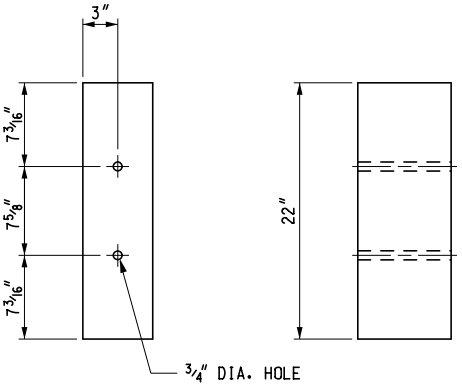


FRONT SIDE

FOR USE ON STEEL POSTS



FRONT SIDE

FOR USE ON WOOD POSTS

(SEE NOTES ON SHEET 16 OF 16)

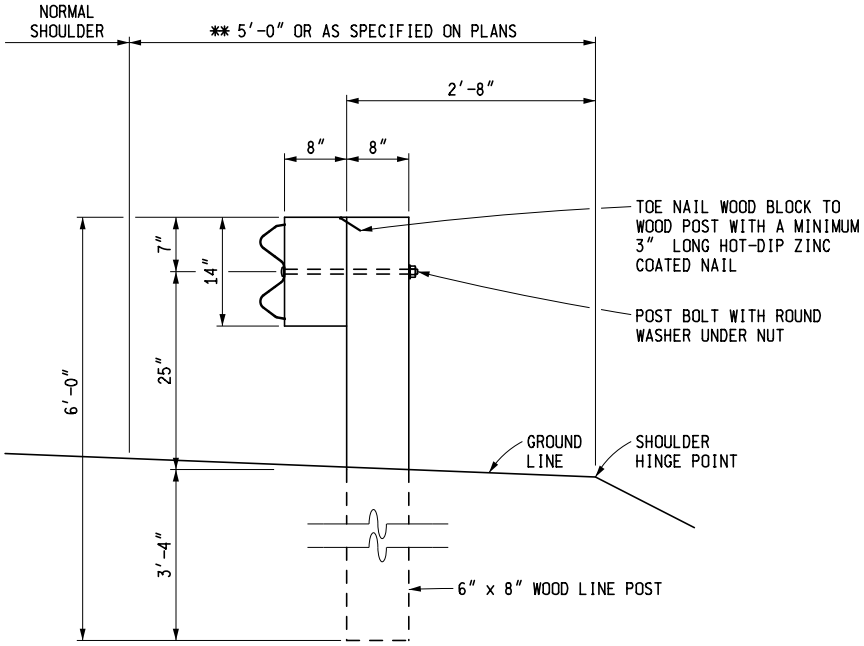
WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE T AND TYPE TD

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

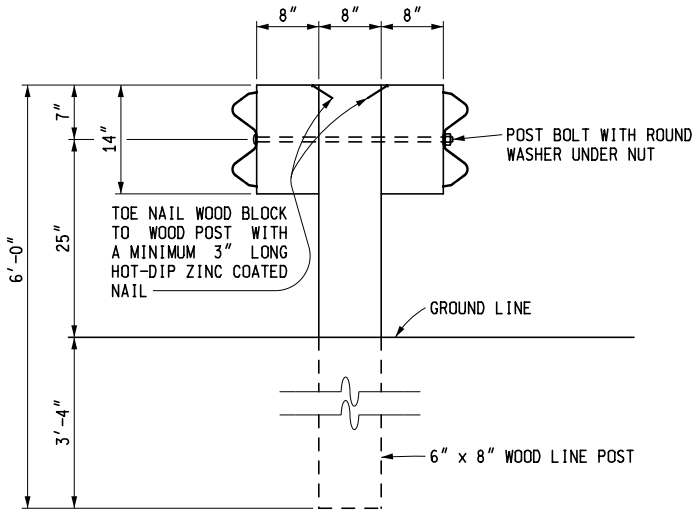
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 6 OF 16



** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12′, USE 3′-0″.

GUARDRAIL, TYPE MGS-8
(WOOD POST)



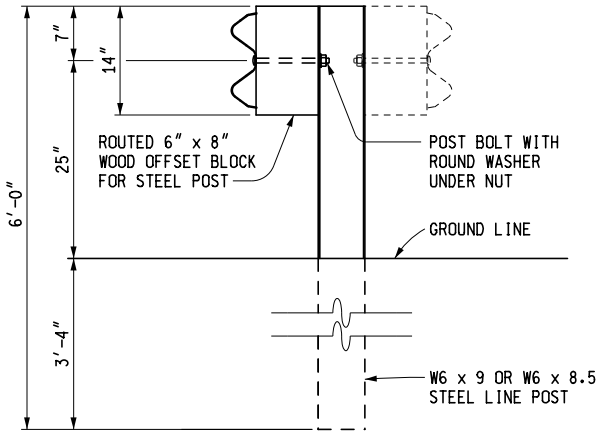
** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12′, USE 3′-0″.

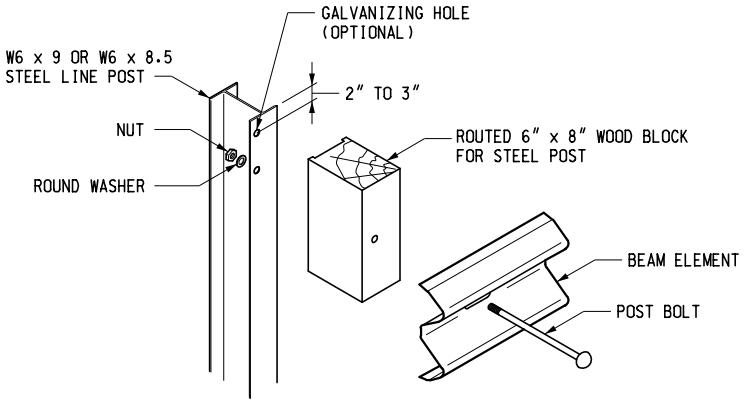
GUARDRAIL, TYPE MGS-8D
(WOOD POST)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

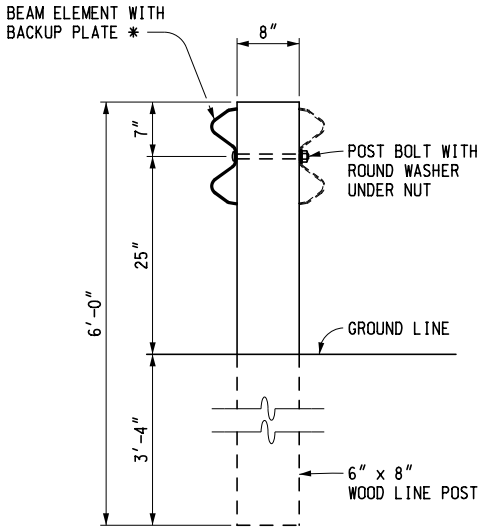
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 7 OF 16

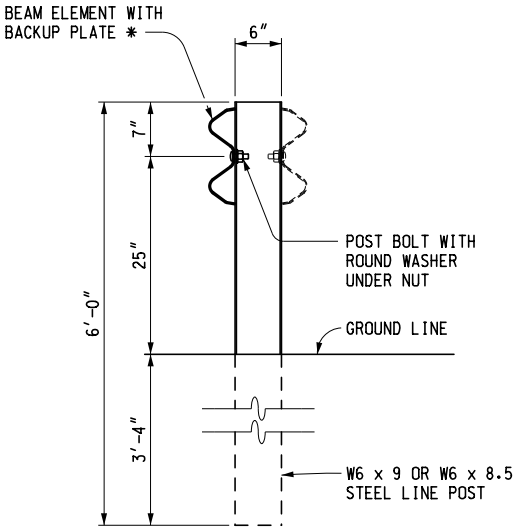




GUARDRAIL, TYPE MGS-8 (OR MGS-8D)
(STEEL POST)



WOOD POST



STEEL POST

GUARDRAIL, TYPE MGS-0 (OR MGS-0D)

* NOTE: BACKUP PLATE MUST BE PLACED BEHIND THE BEAM ELEMENT (BETWEEN THE BEAM ELEMENT AND THE POST).

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

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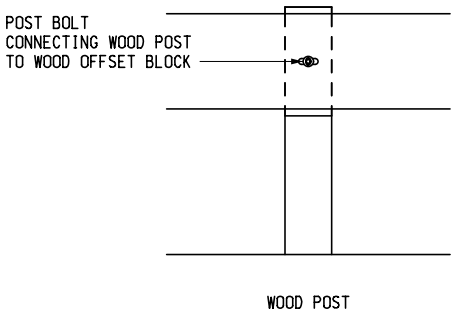
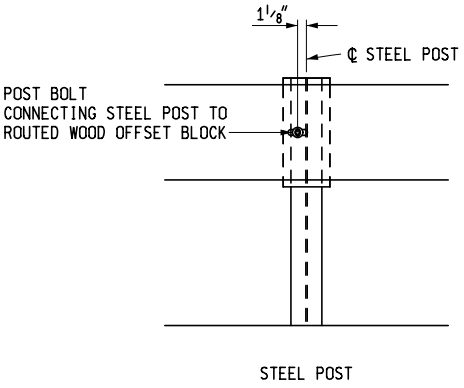
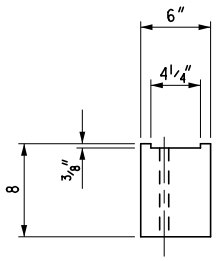


WOOD POST

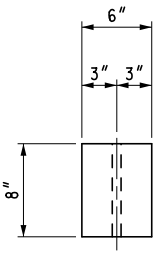


STEEL POST

BLOCK AND POST CONNECTION DETAILS



TOP



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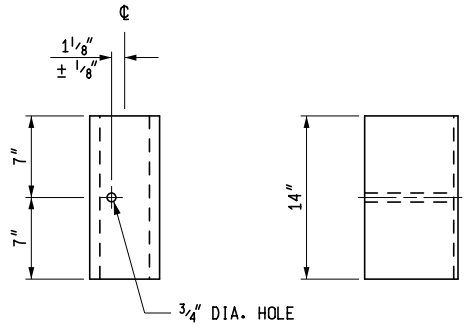
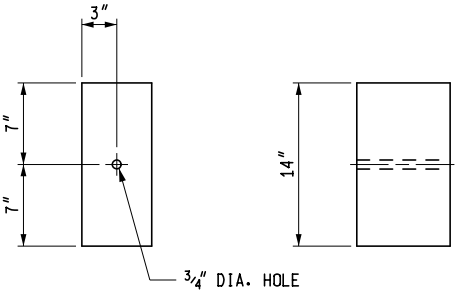


FRONT SIDE

FOR USE ON STEEL POSTS



FRONT SIDE

FOR USE ON WOOD POSTS

(SEE NOTES ON SHEET 16 OF 16)

WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE MGS-8 AND TYPE MGS-8D

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

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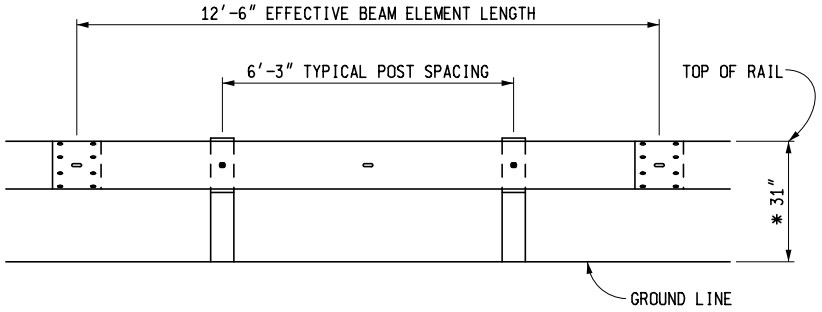
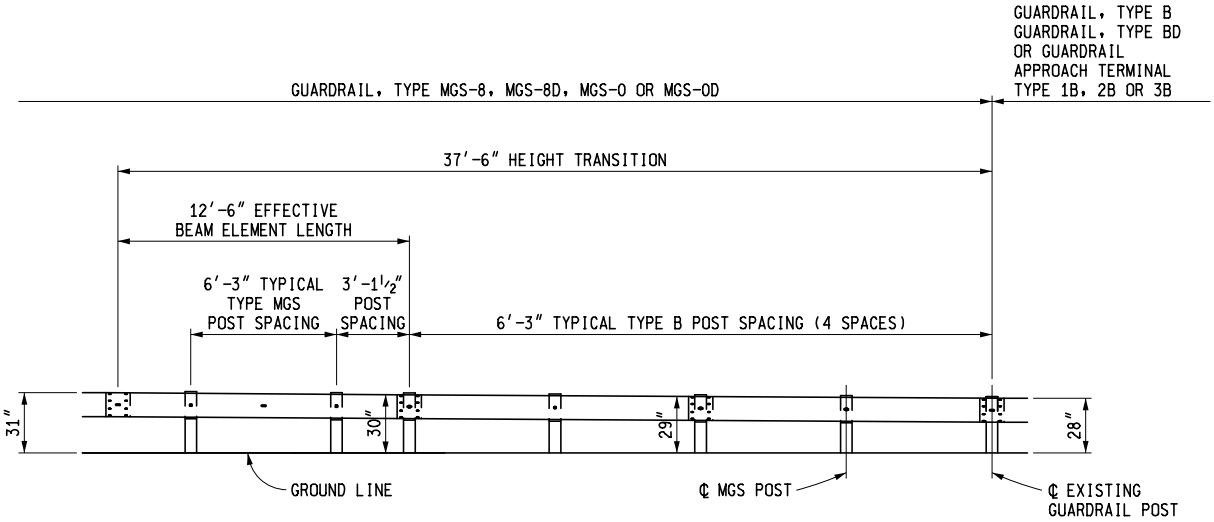
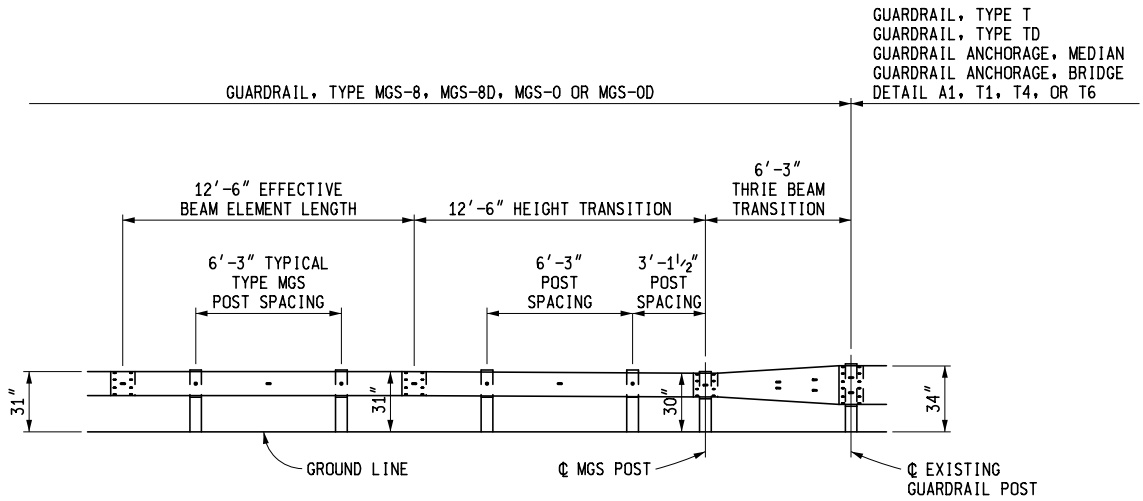


ELEVATION SHOWING POST SPACING FOR
GUARDRAIL, TYPE MGS-8, MGS-8D, MGS-0 OR MGS-0D

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB



ELEVATION SHOWING POST SPACING CONNECTING
GUARDRAIL, TYPE MGS-8, MGS-8D, MGS-0 OR MGS-0D
TO GUARDRAIL, TYPE B, GUARDRAIL, TYPE BD, OR
GUARDRAIL APPROACH TERMINAL TYPE 1B, 2B, OR 3B

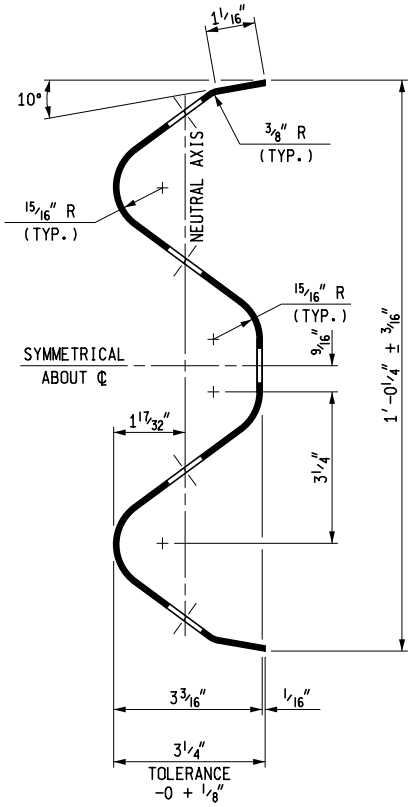


ELEVATION SHOWING POST SPACING CONNECTING
GUARDRAIL, TYPE MGS-8, MGS-8D, MGS-0 OR MGS-0D
TO GUARDRAIL, TYPE T, GUARDRAIL, TYPE TD,
GUARDRAIL ANCHORAGE, MEDIAN,
GUARDRAIL ANCHORAGE, BRIDGE DETAIL A1, T1, T4 OR T6

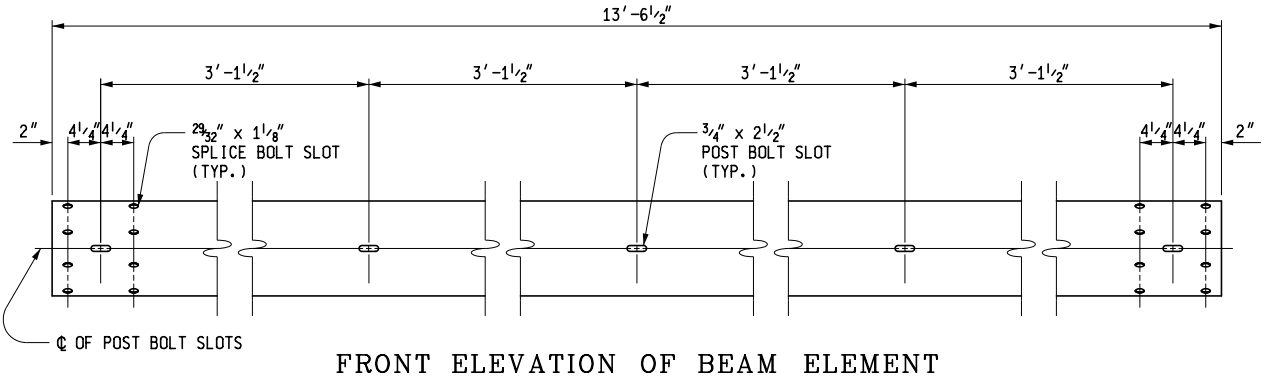
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-8, MGS-8D, MGS-0 & MGS-0D

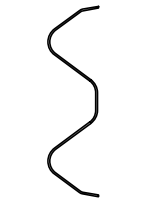
F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 10 OF 16



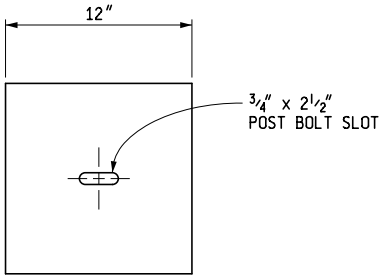
SECTION THROUGH BEAM ELEMENT



FRONT ELEVATION OF BEAM ELEMENT

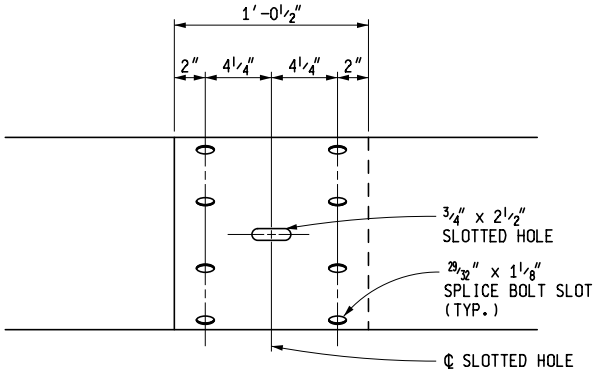


SECTION THROUGH BACKUP PLATE



BACKUP PLATE

USE WITH MGS-O AND MGS-OD POSTS



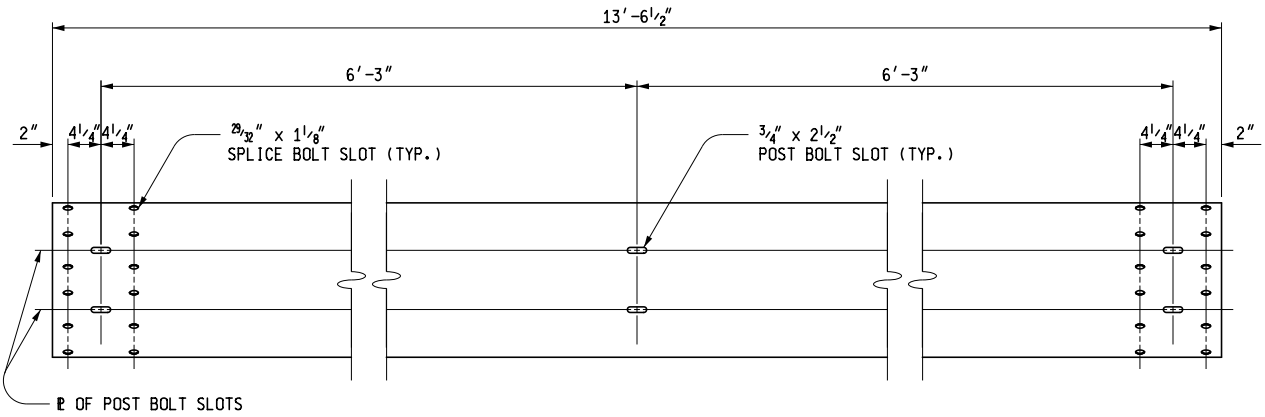
BEAM ELEMENT SPLICE DETAILS

MICHIGAN DEPARTMENT OF TRANSPORTATION

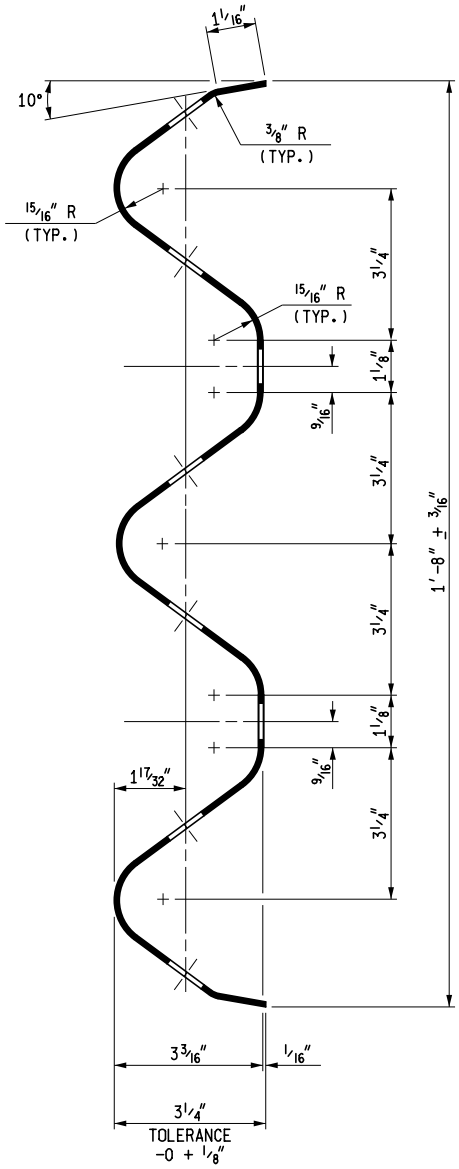
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-O & MGS-OD

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 11 OF 16



FRONT ELEVATION OF THRIE BEAM ELEMENT



SECTION THROUGH THRIE BEAM ELEMENT

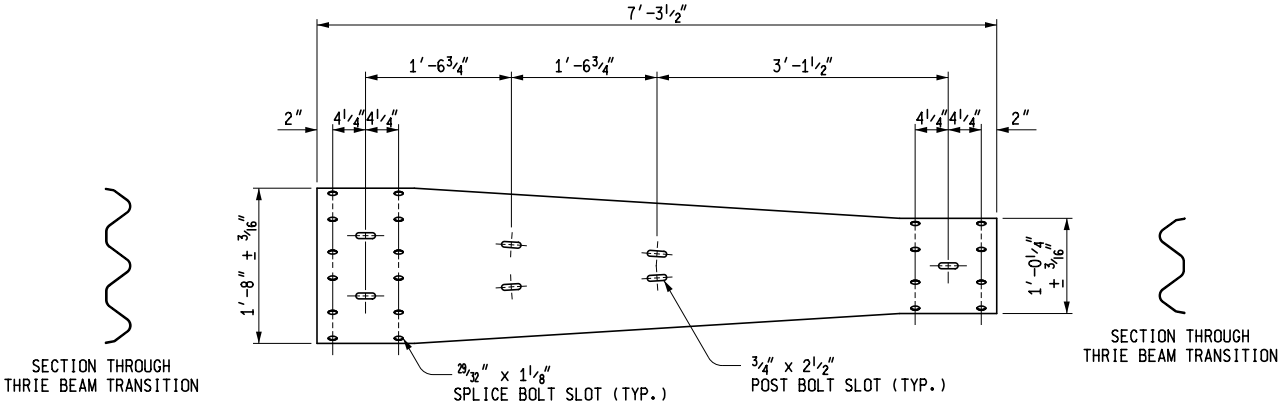
(FOR GUARDRAIL, TYPE T AND TD)

MICHIGAN DEPARTMENT OF TRANSPORTATION

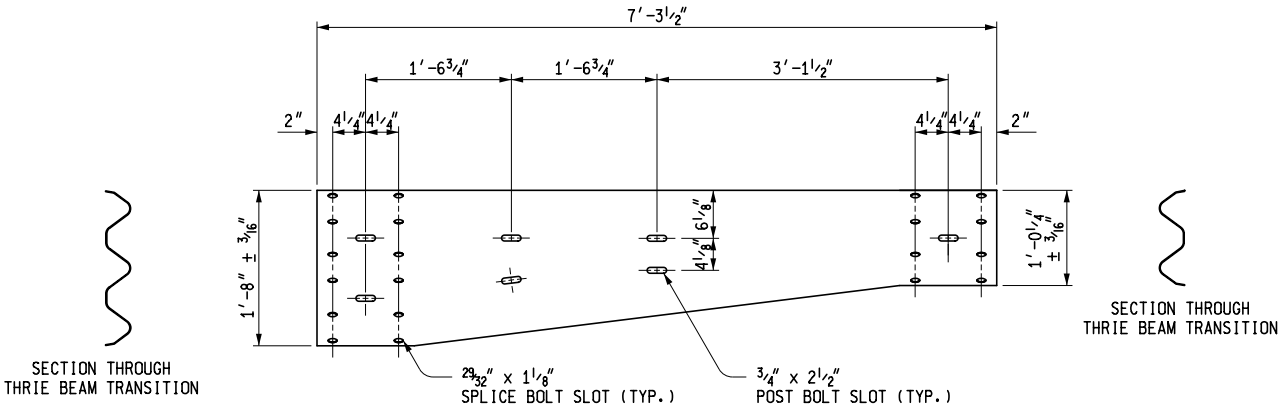
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

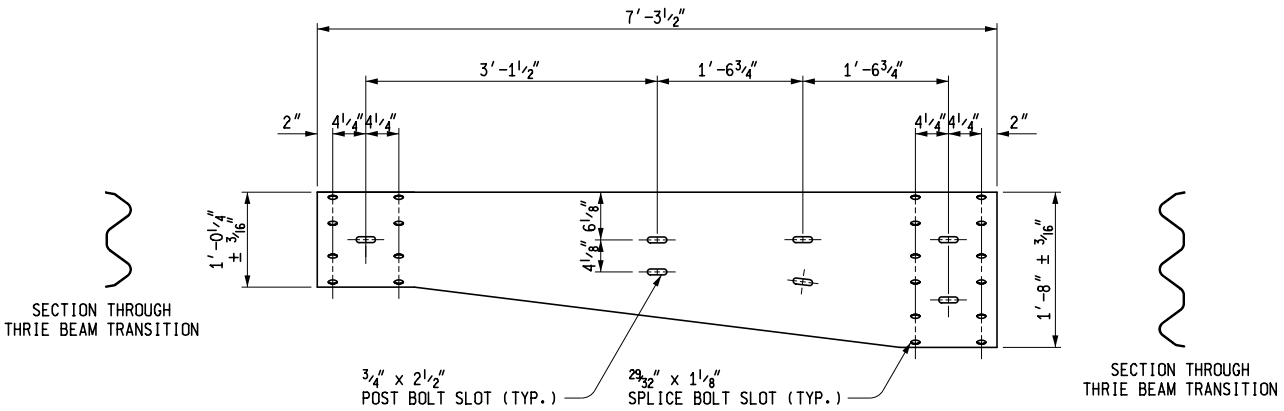
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 12 OF 16



THRIE BEAM TRANSITION





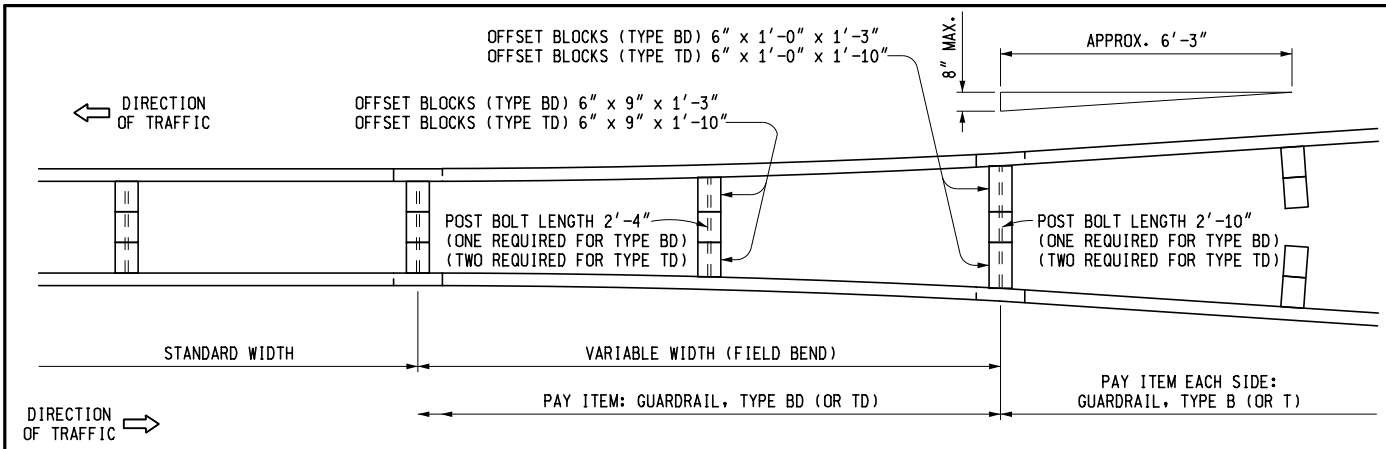
ASYMMETRICAL THRIE BEAM TRANSITIONS

NOTE: ASYMMETRICAL TRANSITION TYPE WILL VARY BY LOCATION DEPENDING ON GUARDRAIL LAYOUT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 13 OF 16



DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE B (OR TYPE T) TO GUARDRAIL, TYPE BD (OR TYPE TD)

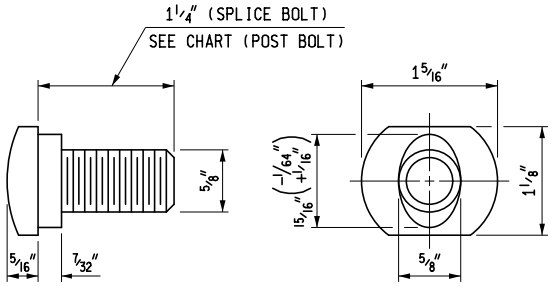
POST BOLTS, SPLICE BOLTS AND WASHERS AT BEAM ELEMENT SPLICE POSTS AND AT INTERMEDIATE POSTS

GUARDRAIL TYPE	POST	OFFSET BLOCK	POST BOLTS NO. REQ'D	POST BOLTS LENGTH	SPLICE BOLTS (1¼" LONG) (NO. REQ'D)		WASHERS (ROUND) (NO. REQ'D)
A	WOOD	N/A	1	9½"	8	NOT NEEDED AT INTERMEDIATE POSTS	1
	STEEL	N/A	1	2"			1
B	WOOD	WOOD	1	18"	8		1
	STEEL	WOOD	1	9½"			1
BD	WOOD	WOOD	1	*26½"	16		——
	STEEL	WOOD	2	9½"			2
T	WOOD	WOOD	2	18"	12		2
	STEEL	WOOD	2	9½"			2
TD	WOOD	WOOD	2	*26½"	24		——
	STEEL	WOOD	4	9½"			4

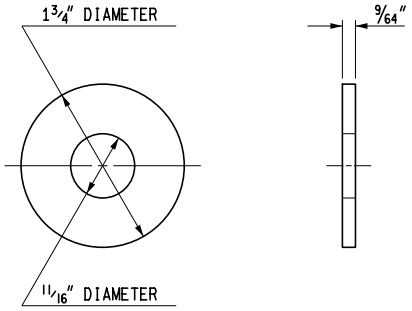
THRIE BEAM TRANSITIONS REQUIRE 20 SPLICE BOLTS EACH (12 ON TYPE T END AND 8 ON TYPE B END).

* EXCEPT AS SPECIFIED ON DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE B (OR TYPE T) TO GUARDRAIL, TYPE BD (OR TYPE TD). POST BOLTS SHALL NOT EXTEND MORE THAN ½" BEYOND NUT.

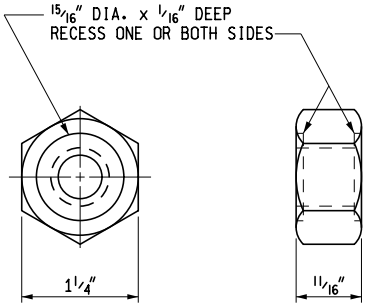
MINIMUM POST BOLT THREAD LENGTH	
BOLT LENGTH	MINIMUM THREAD LENGTH
9½"	1¾"
18"	2½"
26½"	3"



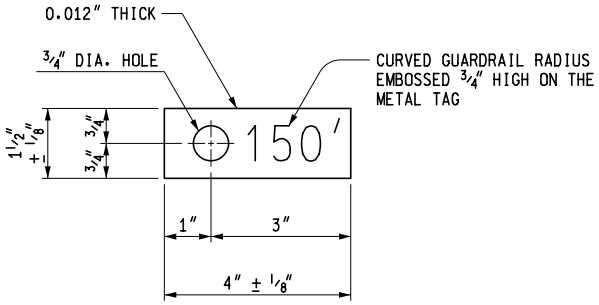
SPLICE BOLT AND POST BOLT



ROUND WASHER



NUT



METAL TAG

FOR CURVED GUARDRAIL WITH RADIUS OF 150' OR LESS

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

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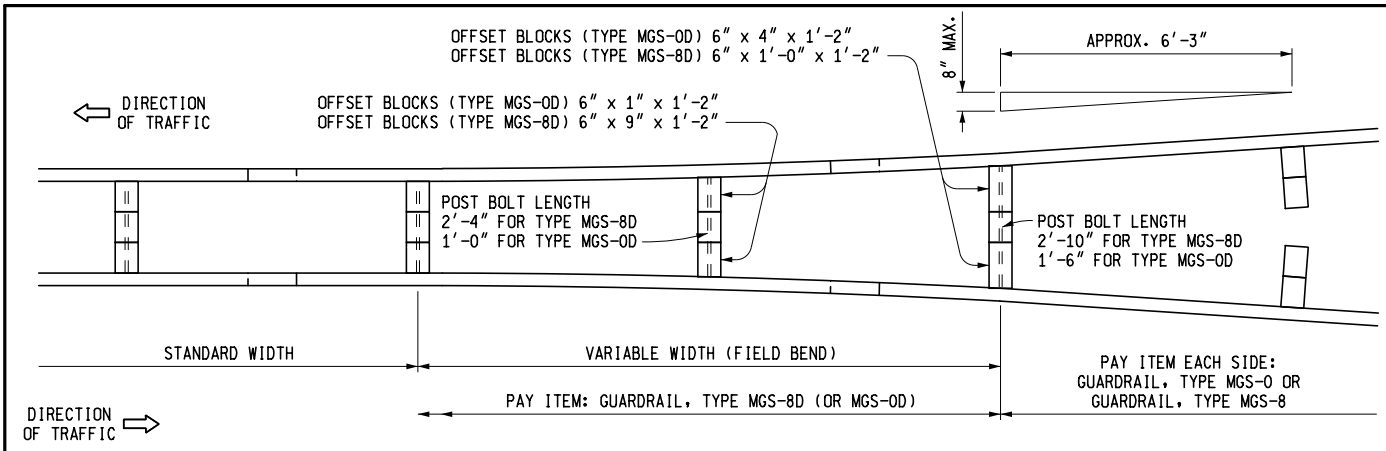


DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE MGS-8 (OR MGS-0) TO GUARDRAIL, TYPE MGS-8D (OR MGS-0D)

(NOTE: DEPICTED ABOVE AS GUARDRAIL, TYPES MGS-8D AND MGS-8 RESPECTIVELY)

POST BOLTS, SPLICE BOLTS AND WASHERS AT BEAM ELEMENT SPLICE POSTS AND AT INTERMEDIATE POSTS

GUARDRAIL TYPE	POST	OFFSET BLOCK	POST BOLTS		SPLICE BOLTS (1¼" LONG) (NO. REQ'D)	WASHERS (ROUND) (NO. REQ'D)
			NO. REQ'D	LENGTH		
MGS-0	WOOD	N/A	1	9½"	8	1
	STEEL	N/A	1	2"		1
MGS-0D	WOOD	N/A	1	9½"	16	1
	STEEL	N/A	2	2"		1
MGS-8	WOOD	WOOD	1	18"	8	1
	STEEL	WOOD	1	9½"		1
MGS-8D	WOOD	WOOD	1	*26½"	16	———
	STEEL	WOOD	2	9½"		2

THRIE BEAM TRANSITIONS REQUIRE 20 SPLICE BOLTS EACH (12 ON TYPE T END AND 8 ON TYPE MGS END).

* EXCEPT AS SPECIFIED ON DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE MGS-8 (MGS-0) TO GUARDRAIL, TYPE MGS-8D (MGS-0D), POST BOLTS SHALL NOT EXTEND MORE THAN ½" BEYOND NUT.

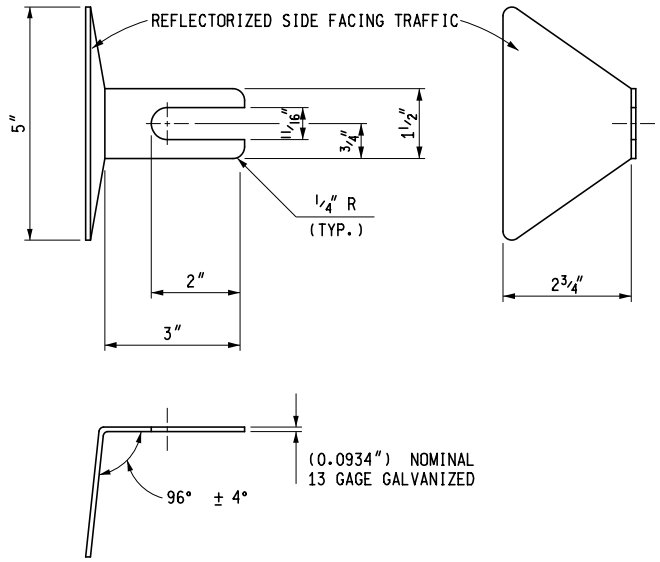
MINIMUM POST BOLT THREAD LENGTH

BOLT LENGTH	MINIMUM THREAD LENGTH
9½"	1¾"
18"	2½"
26½"	3"

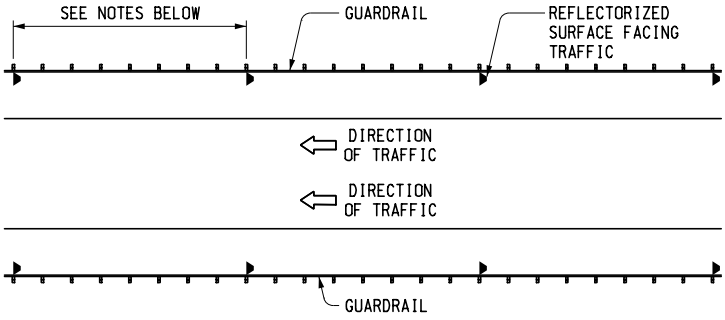
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

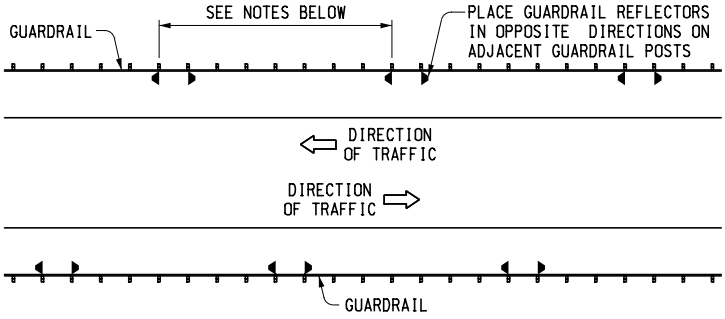
F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 15 OF 16



GUARDRAIL REFLECTOR



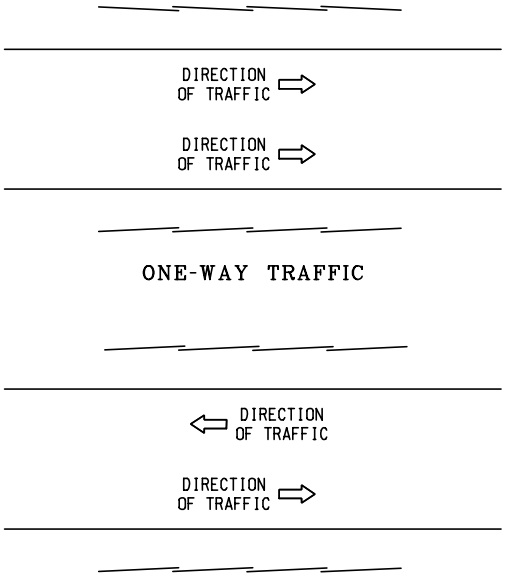
ONE-WAY TRAFFIC



TWO-WAY TRAFFIC

PLACEMENT OF GUARDRAIL REFLECTORS

NOTES GOVERNING THE USE OF GUARDRAIL REFLECTORS



TWO-WAY TRAFFIC

DIRECTION OF RAIL LAP

NOTES:

DETAILS SPECIFIED ON THIS STANDARD ARE ACCORDING TO THE AASHTO-AGC-ARTBA JOINT COMMITTEE, TASK FORCE 13 PUBLICATION TITLED "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE."

BEAM ELEMENTS SHALL BE SHOP BENT TO PLAN RADIUS FOR CURVE RADII 150' OR LESS. A TAG IDENTIFYING THE CURVATURE OF THE SHOP BENT SECTION WILL BE REQUIRED FOR EACH CURVED ELEMENT.

SEE STANDARD PLAN R-61-SERIES, R-62-SERIES OR R-63-SERIES FOR GUARDRAIL APPROACH TERMINALS, STANDARD PLAN R-66-SERIES FOR GUARDRAIL DEPARTING TERMINALS AND STANDARD PLAN R-67-SERIES FOR GUARDRAIL ANCHORAGE, BRIDGE.

WHEN THE PLANS SPECIFY GUARDRAIL (TYPE B OR T) TO BE PLACED ON THE SHOULDER HINGE POINT, RATHER THAN AS SPECIFIED ON THIS PLAN, 8'-0" POSTS SHALL BE PROVIDED, WITH THE ADDITIONAL LENGTH EMBEDDED FOR ADDED STABILITY. (NOT NECESSARY WHEN THE SLOPE IS REASONABLY LEVEL BEYOND THE SHOULDER HINGE POINT, AS DETERMINED BY THE ENGINEER.)

WHEN THE PLANS SPECIFY GUARDRAIL (TYPE MGS-8 OR MGS-0) TO BE PLACED ON THE SHOULDER HINGE POINT, RATHER THAN AS SPECIFIED ON THIS PLAN, 9'-0" POSTS SHALL BE PROVIDED, WITH THE ADDITIONAL LENGTH EMBEDDED FOR ADDED STABILITY. (NOT NECESSARY WHEN THE SLOPE IS REASONABLY LEVEL BEYOND THE SHOULDER HINGE POINT, AS DETERMINED BY THE ENGINEER.)

WOOD POSTS WITH 1/2" BEVELS AT THE TOP MAY BE USED IN LIEU OF WOOD POSTS WITHOUT BEVELS SPECIFIED. THE LENGTH, WIDTH AND DEPTH OF THE POST SHALL BE AS SPECIFIED ON THIS STANDARD AND THE POST BOLT HOLES SHALL BE LOCATED TO ENSURE PROPER RAIL HEIGHT.

WOOD OFFSET BLOCKS WITH 1/2" BEVELS AT THE TOP AND BOTTOM OR A 1" BEVELED TOP MAY BE USED IN LIEU OF WOOD BLOCKS WITHOUT BEVELS SPECIFIED. THE LENGTH (FRONT AND BACK FACE), WIDTH AND DEPTH OF THE BLOCK SHALL BE AS SPECIFIED ON THIS STANDARD AND THE POST BOLT HOLES SHALL BE LOCATED TO ENSURE PROPER RAIL HEIGHT AND COMPATIBILITY WITH POST HOLES.

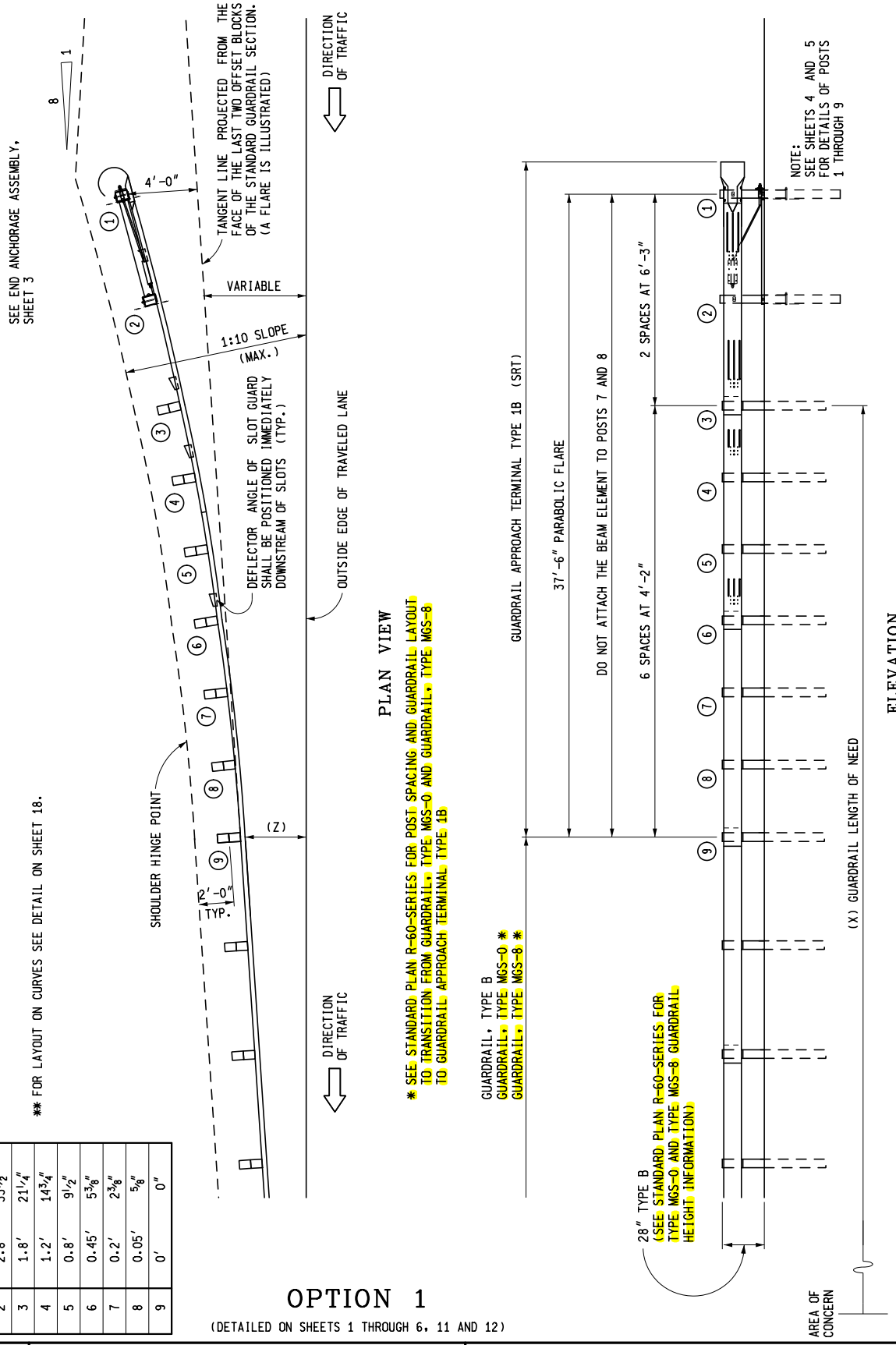
WHEN THE FACE OF GUARDRAIL IS PLACED FLUSH WITH FACE OF CURB, THE RAIL HEIGHT SHOULD BE MEASURED FROM THE FRONT EDGE OF THE GUTTER PAN, WHICH IS THE POINT ON THE GUTTER PAN THAT IS CLOSEST TO THE EDGE OF THE TRAVELED LANE. WHEN THE FACE OF THE GUARDRAIL PANEL IS LOCATED BEHIND THE CURB THE RAIL HEIGHT SHOULD BE MEASURED FROM THE GROUND JUST IN FRONT OF THE GUARDRAIL.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D

F.H.W.A. APPROVAL	2-1-2016 PLAN DATE	R-60-J	SHEET 16 OF 16



THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE WOOD OFFSET BLOCKS, EXCEPT FOR THE FIRST AND SECOND POSTS WHICH ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS ARE TO BE LOCATED BY CHORD MEASUREMENTS AT THE BACK OF THE RAIL EQUAL TO THE NOMINAL POST SPACINGS SPECIFIED. POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

** FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 18.

POST	** POST OFFSET DISTANCE
1	4.0′ 48″
2	2.8′ 33½″
3	1.8′ 21¼″
4	1.2′ 14¾″
5	0.8′ 9½″
6	0.45′ 5⅜″
7	0.2′ 2⅜″
8	0.05′ 5/8″
9	0′ 0″

OPTION 1

(DETAILED ON SHEETS 1 THROUGH 6, 11 AND 12)

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

APPROVED BY: _____
ENGINEER OF DELIVERY

APPROVED BY: _____
ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

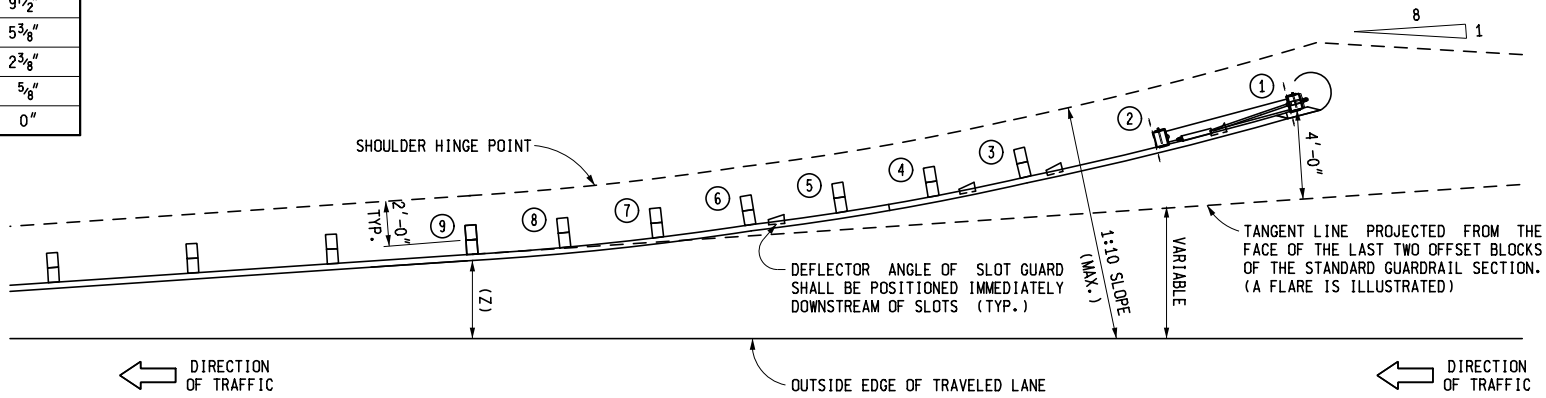
F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 1 OF 19

POST	** POST OFFSET DISTANCE	
1	4.0′	48″
2	2.8′	33 1/2″
3	1.8′	21 1/4″
4	1.2′	14 3/4″
5	0.8′	9 1/2″
6	0.45′	5 3/8″
7	0.2′	2 3/8″
8	0.05′	5/8″
9	0′	0″

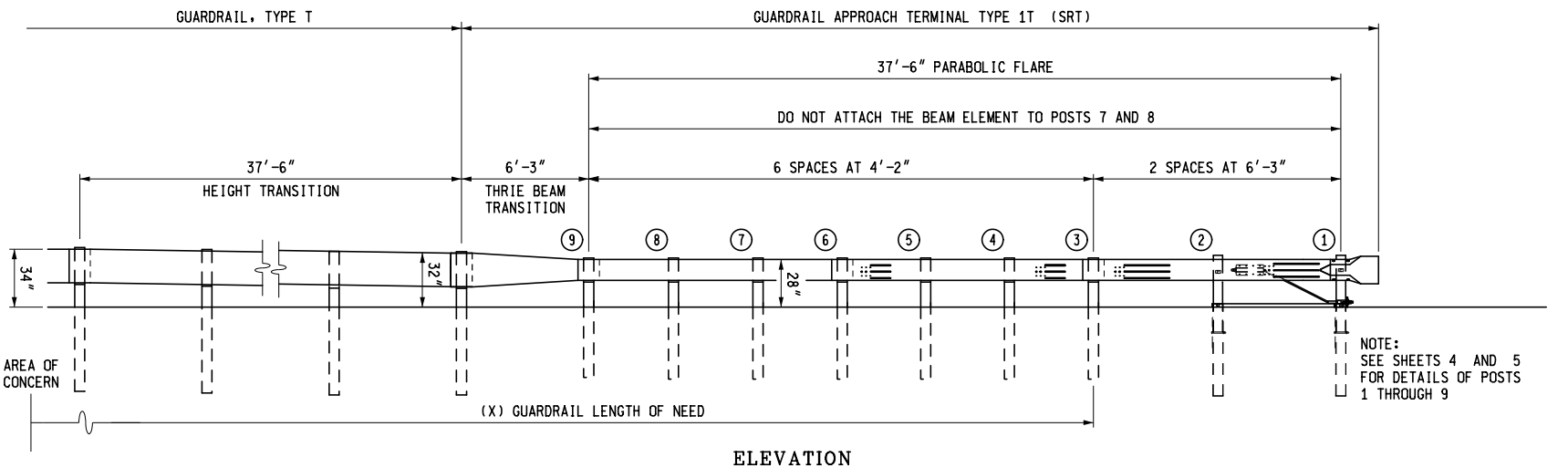
THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE WOOD OFFSET BLOCKS, EXCEPT FOR THE FIRST AND SECOND POSTS WHICH ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS ARE TO BE LOCATED BY CHORD MEASUREMENTS AT THE BACK OF THE RAIL EQUAL TO THE NOMINAL POST SPACINGS SPECIFIED. POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

** FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 18.

SEE END ANCHORAGE ASSEMBLY, SHEET 3



PLAN VIEW



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1T "SRT"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

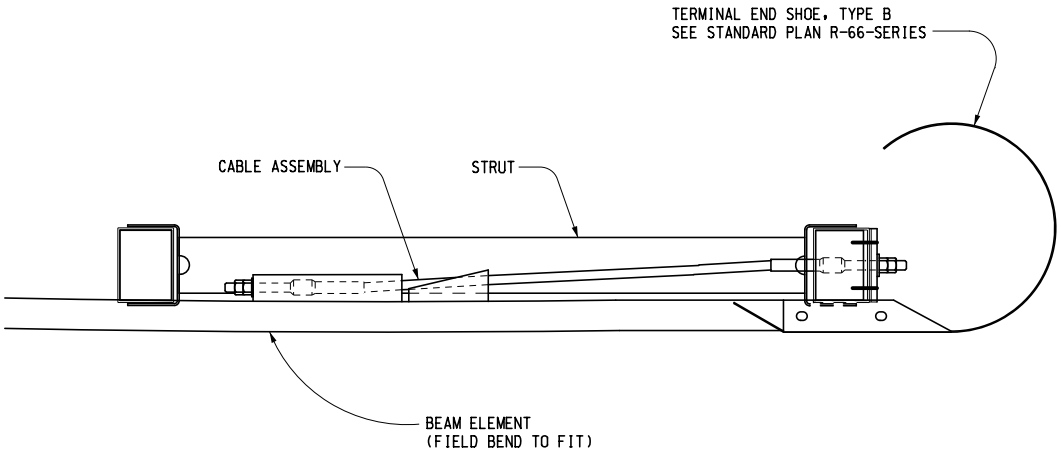
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

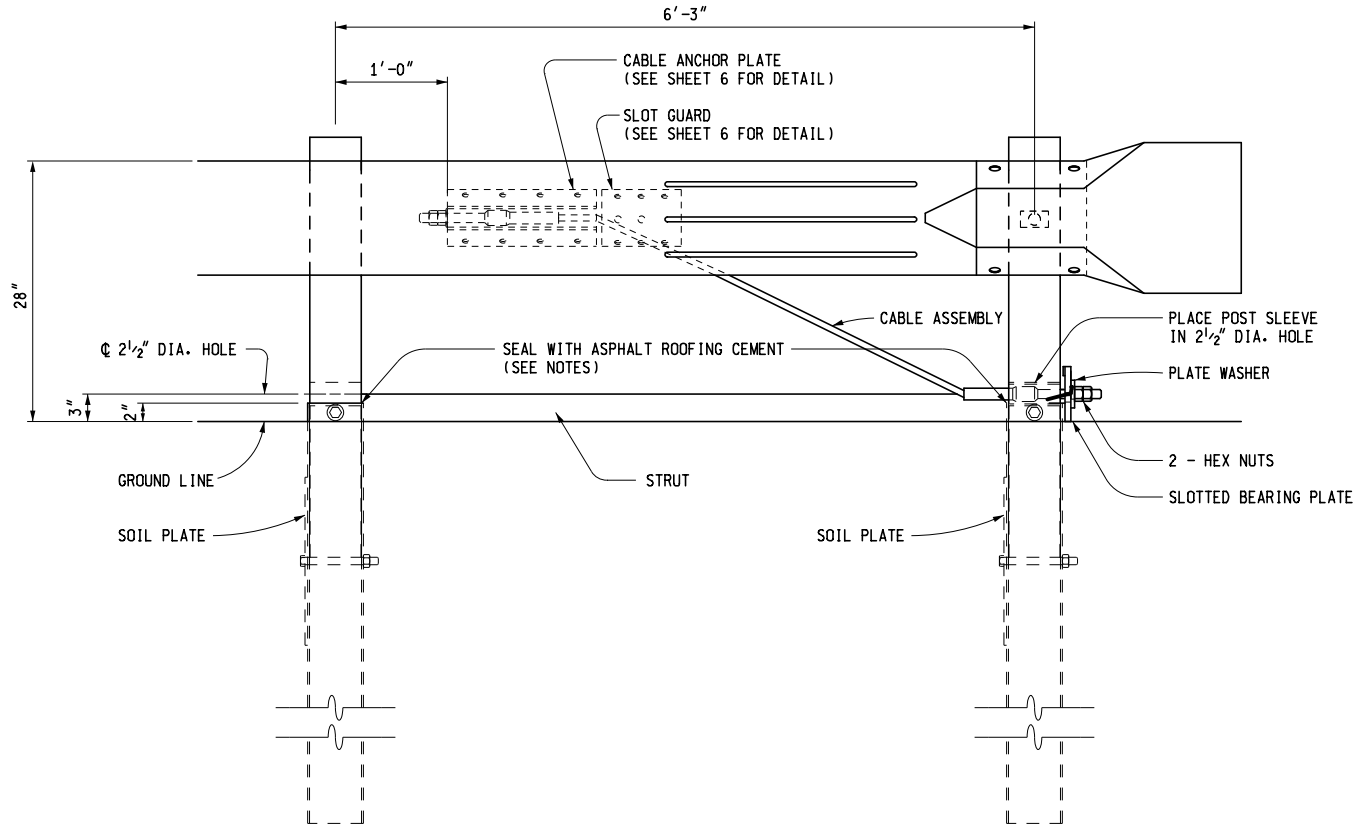
2-9-2016
PLAN DATE

R-61-H

SHEET 2 OF 19



PLAN VIEW



ELEVATION

END ANCHORAGE ASSEMBLY
(SRT)

NOTES:

DETAILS ON THIS SHEET ONLY APPLY TO "SRT".

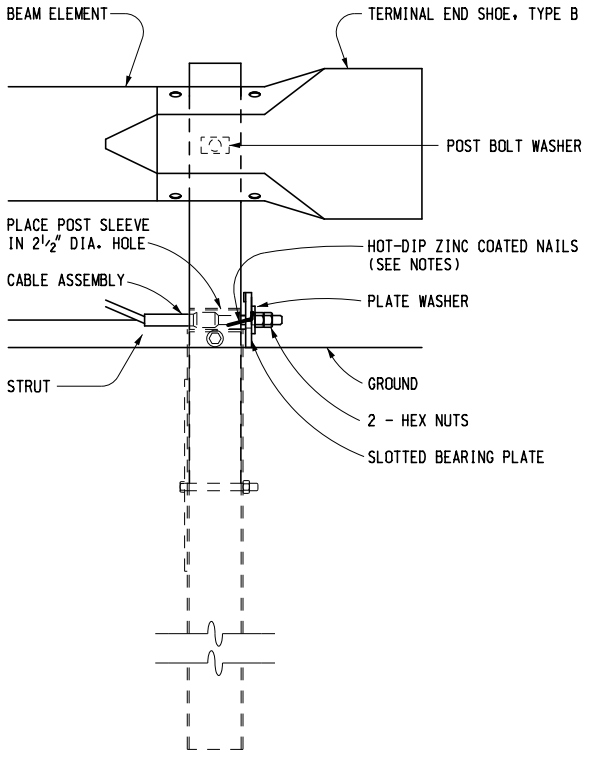
AFTER THE CABLE ASSEMBLY HAS BEEN TIGHTENED, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

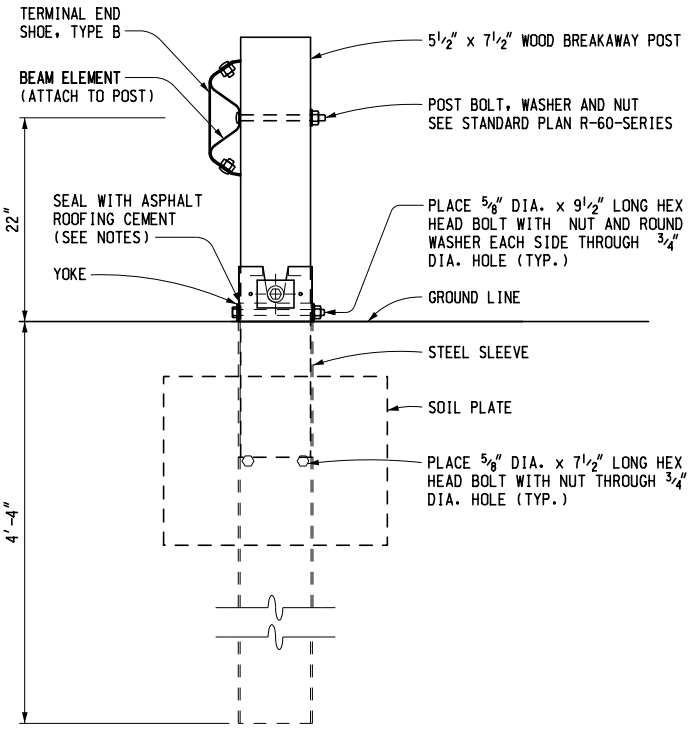
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 3 OF 19

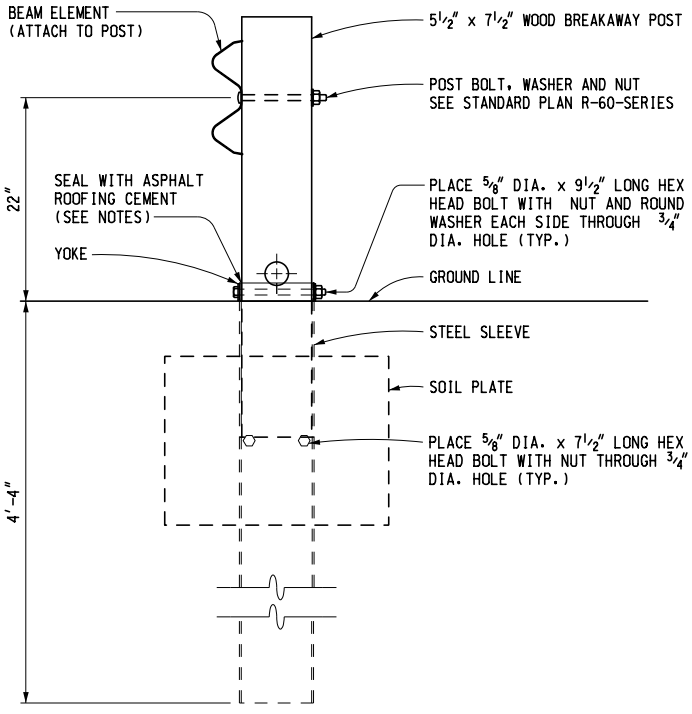


ELEVATION



SIDE

POST 1 DETAIL
(SRT)



POST 2 DETAIL
(SRT)

NOTES:

DETAILS ON THIS SHEET ONLY APPLY TO "SRT".

TWO HOT-DIP ZINC COATED NAILS SHALL BE DRIVEN INTO THE WOOD POST THROUGH THE HOLES IN THE SLOTTED BEARING PLATE ON POST 1 OF THE "SRT" TO KEEP THE PLATE FROM ROTATING.

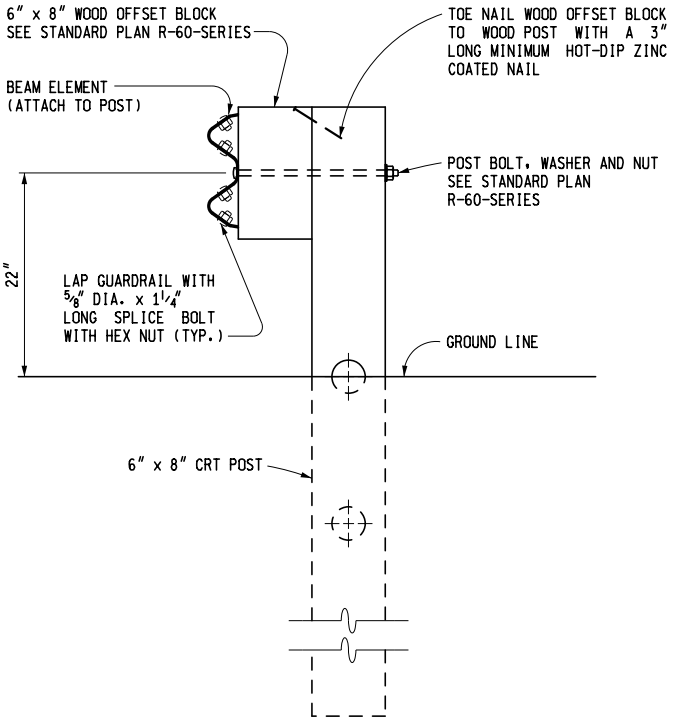
AFTER THE CABLE ASSEMBLY HAS BEEN TIGHTENED, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

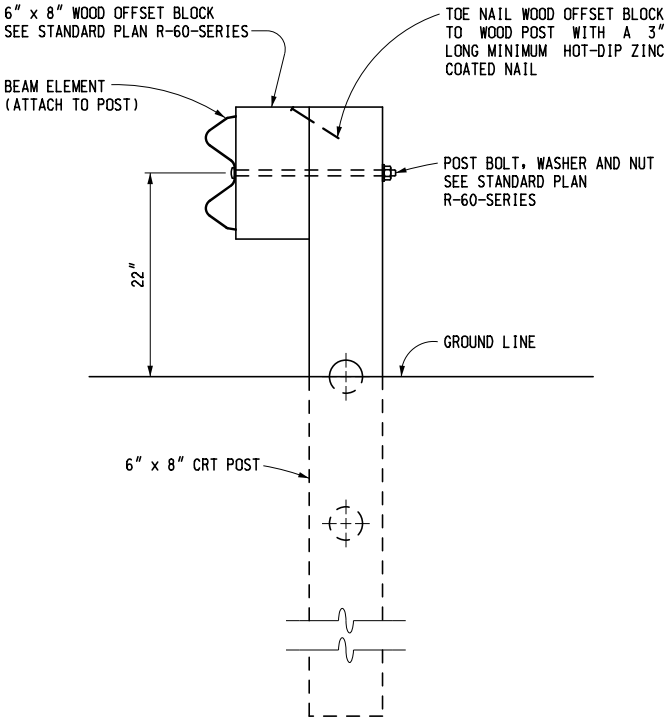
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

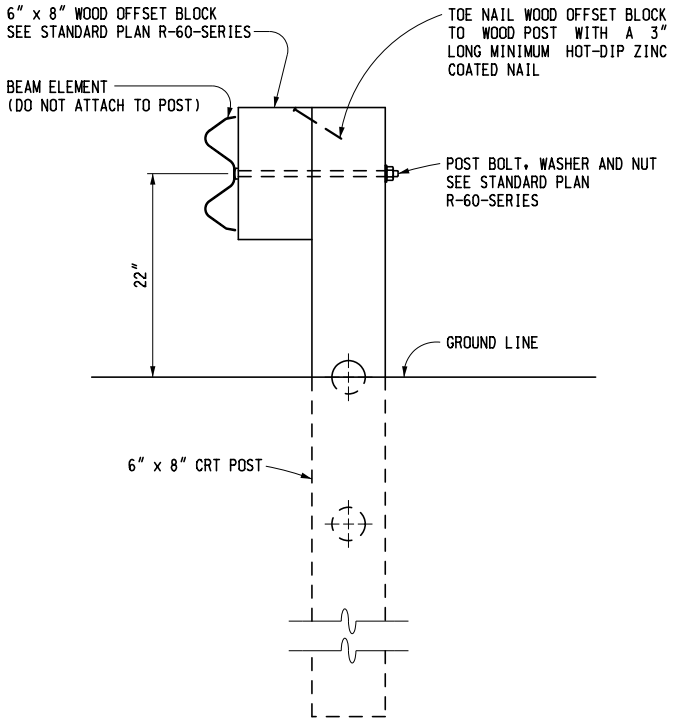
F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 4 OF 19



POST 3 AND 6 DETAIL
(SRT)



POST 4 AND 5 DETAIL
(SRT)



POST 7 AND 8 DETAIL
(SRT)

NOTE: POST 9 IS A STANDARD LINE POST

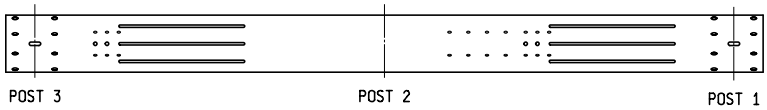
NOTE:

DETAILS ON THIS SHEET ONLY APPLY TO "SRT".

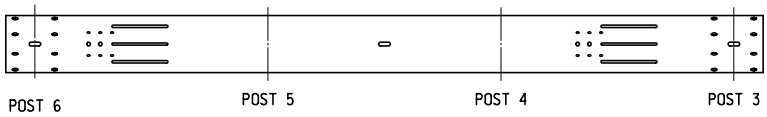
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

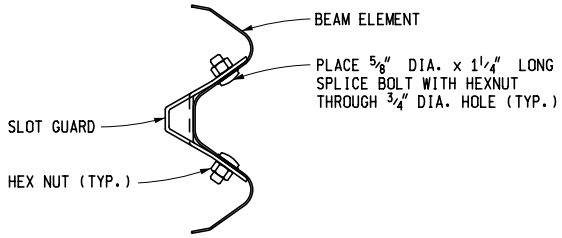
F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 5 OF 19



SLOTTED RAIL BEAM ELEMENT
(POST 1 THROUGH 3)

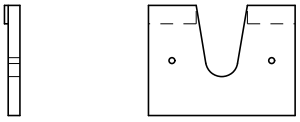


SLOTTED RAIL BEAM ELEMENT
(POST 3 THROUGH 6)



ASSEMBLY DETAIL

SLOT GUARD DETAILS



SLOTTED BEARING PLATE

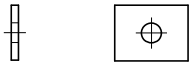
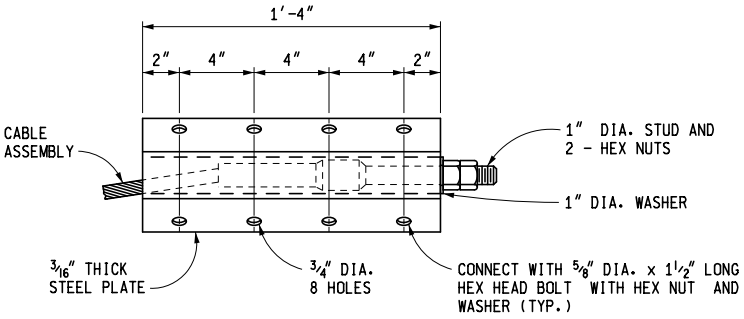
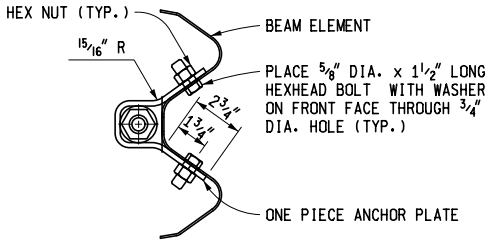


PLATE WASHER

NOTE: ALL "SRT" ITEMS ILLUSTRATED WITHOUT DIMENSIONS SHALL BE ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.





CABLE ANCHOR PLATE DETAILS
(SRT)

NOTES:

DETAILS ON THIS SHEET ONLY APPLY TO "SRT".

AFTER THE CABLE ASSEMBLY HAS BEEN TIGHTENED, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 6 OF 19

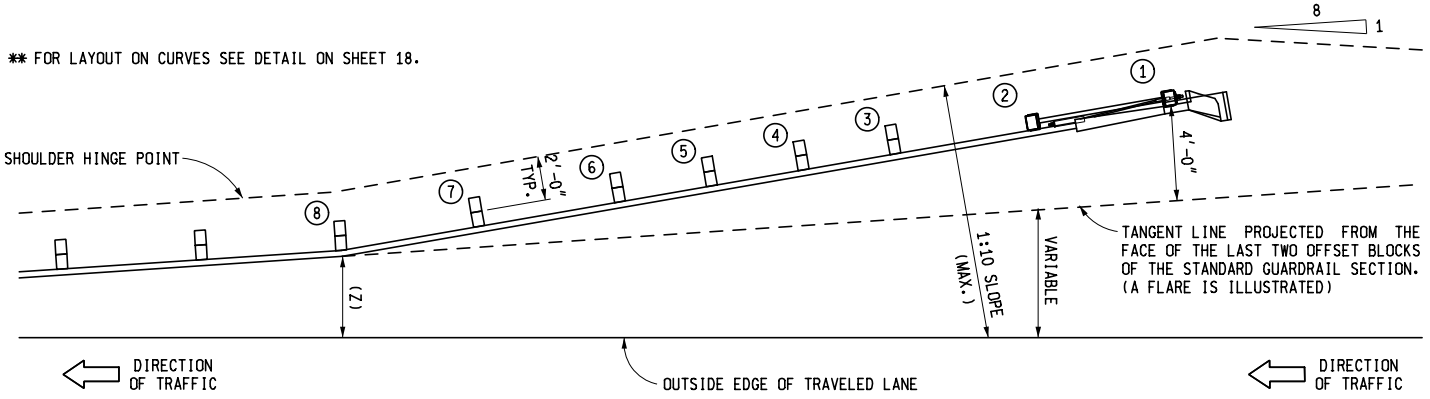
POST	** POST OFFSET DISTANCE	
1	4.0′	48″
2	3.33′	40″
3	2.67′	32″
4	2.22′	$26\frac{11}{16}$″
5	1.77′	$21\frac{5}{16}$″
6	1.33′	16″
7	0.67′	8″
8	0′	0″

THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE WOOD OFFSET BLOCKS, EXCEPT FOR THE FIRST AND SECOND POSTS WHICH ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS ARE TO BE LOCATED BY CHORD MEASUREMENTS AT THE BACK OF THE RAIL EQUAL TO THE NOMINAL POST SPACINGS SPECIFIED. POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

** FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 18.

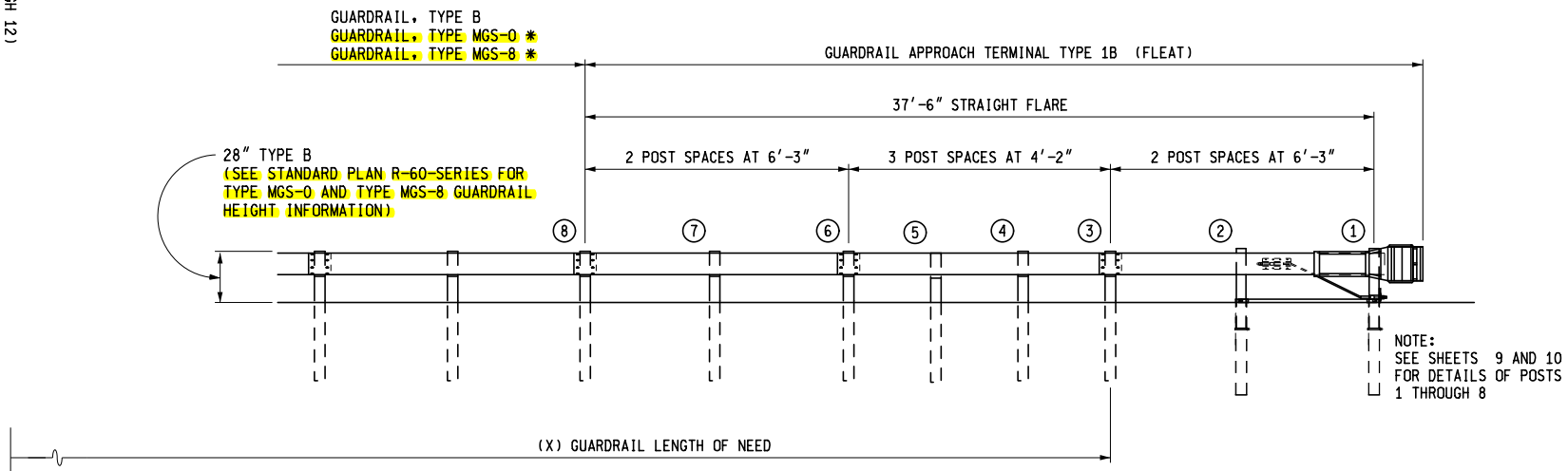
OPTION 2

(DETAILED ON SHEETS 7 THROUGH 12)



PLAN VIEW

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-O AND GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL TYPE 1B



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1B "FLEAT"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

2-9-2016
PLAN DATE

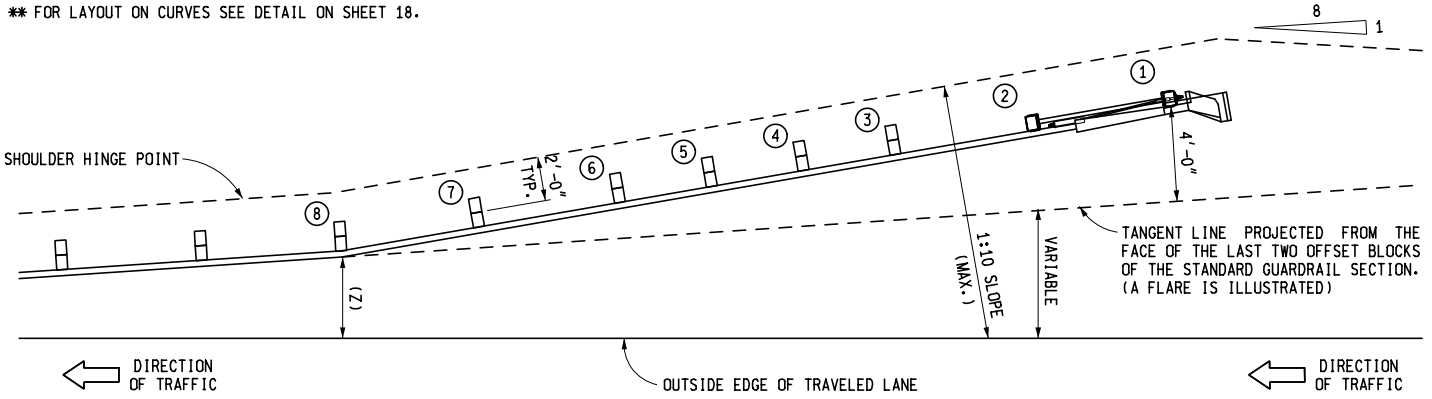
R-61-H

SHEET 7 OF 19

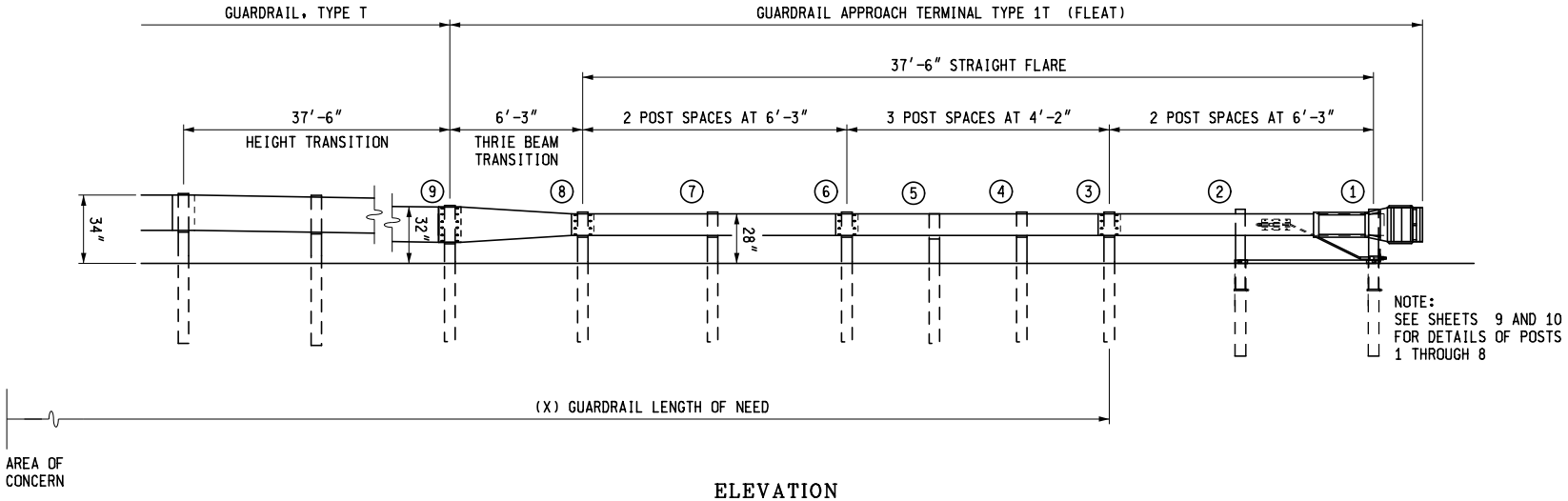
POST	** POST OFFSET DISTANCE	
1	4.0′	48″
2	3.33′	40″
3	2.67′	32″
4	2.22′	$26\frac{11}{16}$″
5	1.77′	$21\frac{5}{16}$″
6	1.33′	16″
7	0.67′	8″
8	0′	0″

THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE WOOD OFFSET BLOCKS, EXCEPT FOR THE FIRST AND SECOND POSTS WHICH ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS ARE TO BE LOCATED BY CHORD MEASUREMENTS AT THE BACK OF THE RAIL EQUAL TO THE NOMINAL POST SPACINGS SPECIFIED. POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

** FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 18.



PLAN VIEW



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1T "FLEAT"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

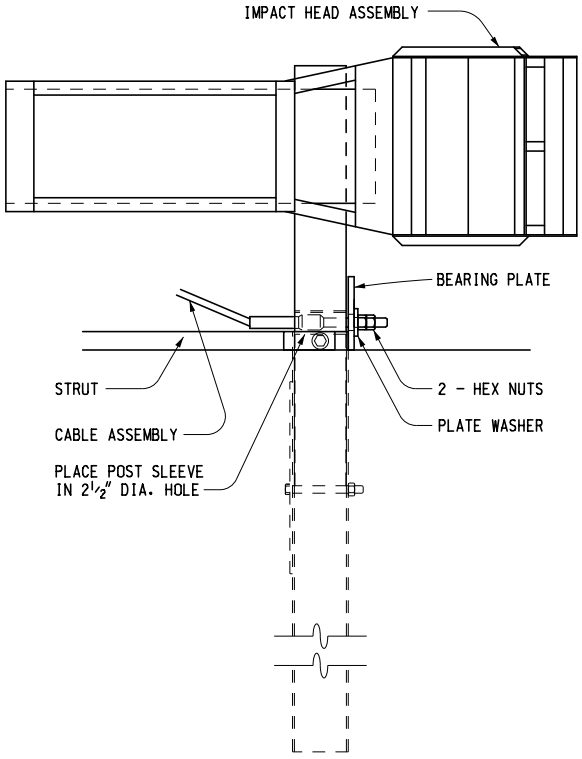
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

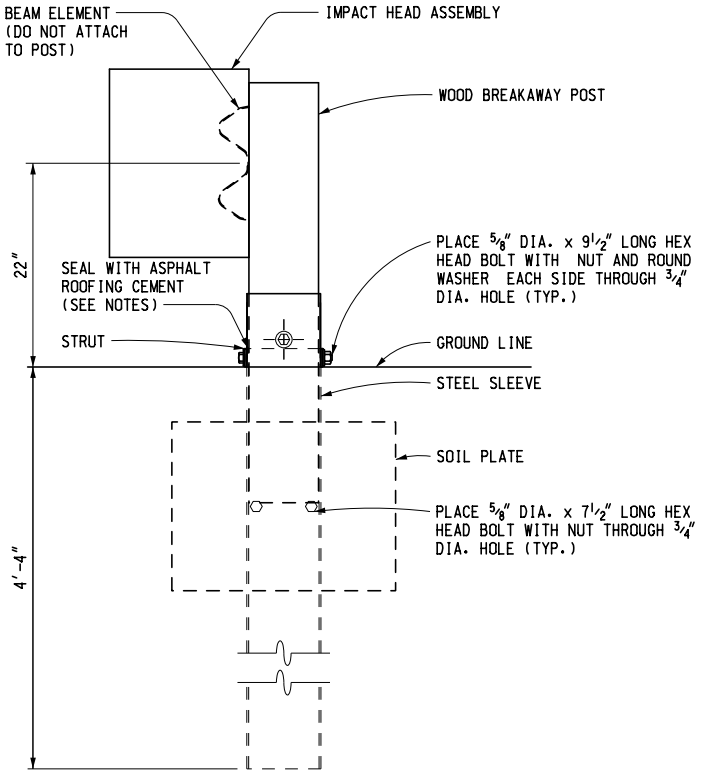
2-9-2016
PLAN DATE

R-61-H

SHEET 8 OF 19



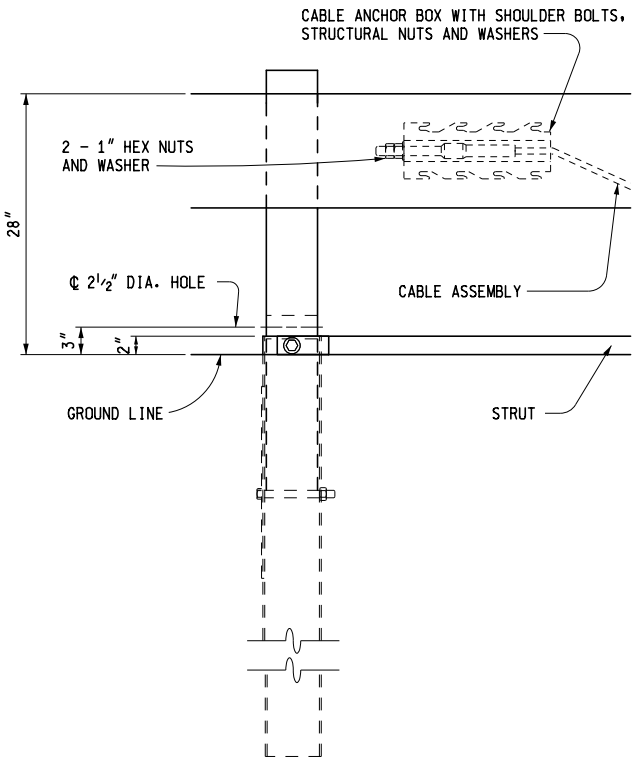
ELEVATION



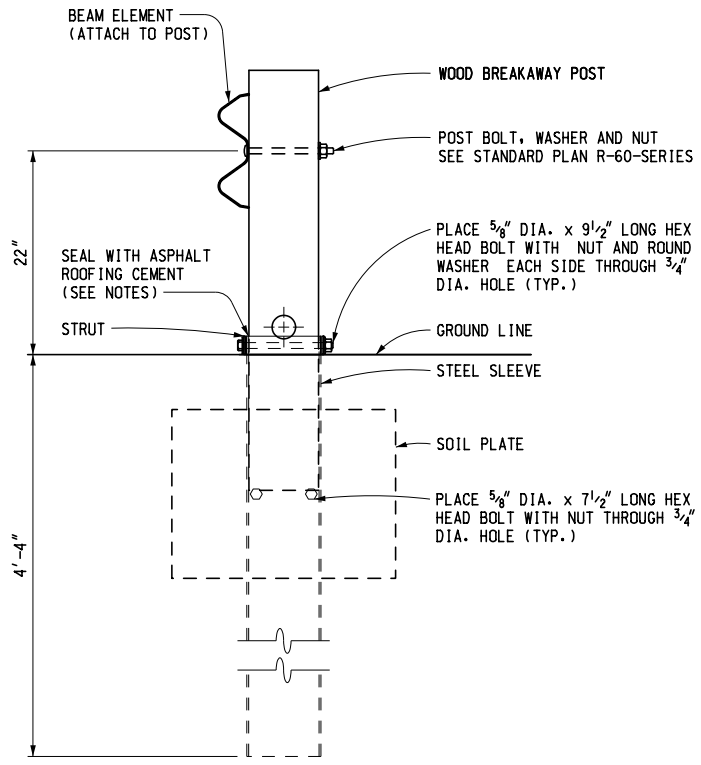
SIDE

POST 1 DETAIL

(FLEAT)



ELEVATION



SIDE

POST 2 DETAIL

(FLEAT)

NOTES:

DETAILS ON THIS SHEET ONLY APPLY TO "FLEAT".

AFTER THE CABLE ASSEMBLY HAS BEEN TIGHTENED, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

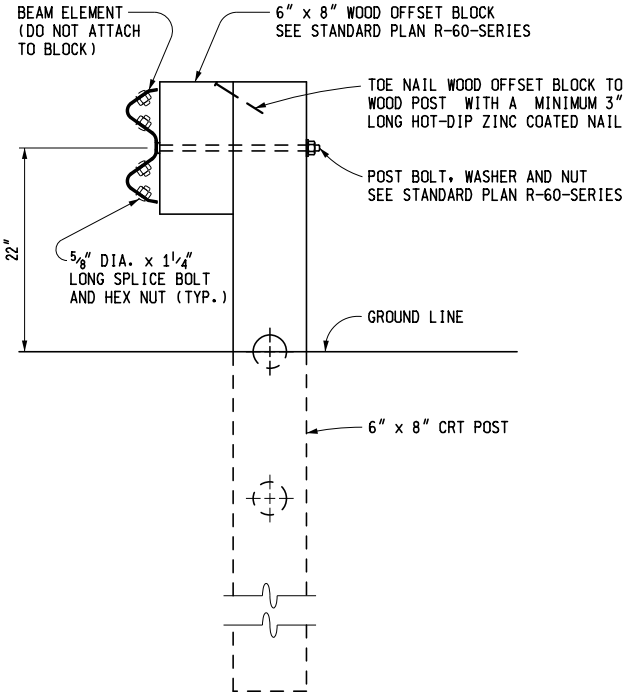
ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

MICHIGAN DEPARTMENT OF TRANSPORTATION

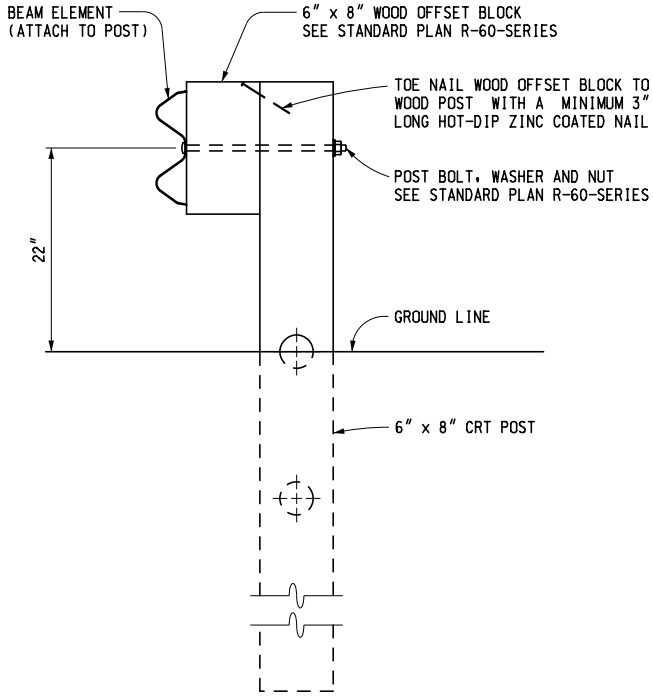
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 9 OF 19

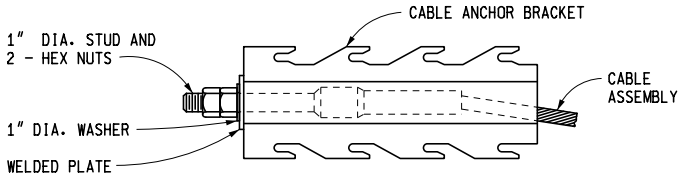


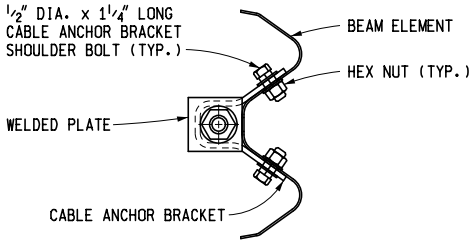
POST 3 DETAIL
(FLEAT)



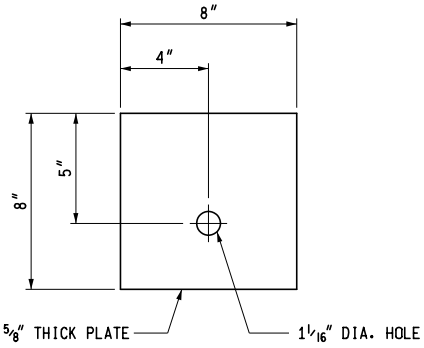
POST 4 THROUGH 7 DETAIL
(FLEAT)

NOTE: POST 8 IS A STANDARD LINE POST

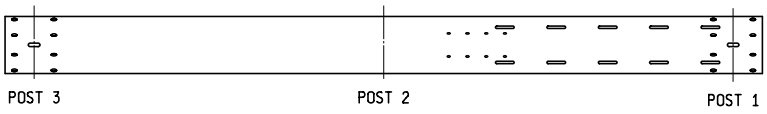




CABLE ANCHOR BRACKET DETAIL
(FLEAT)



BEARING PLATE
(FLEAT)



W-BEAM GUARDRAIL END SECTION
(POST 1 THROUGH 3)

NOTE: ALL "FLEAT" ITEMS ILLUSTRATED WITHOUT DIMENSIONS SHALL BE ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

NOTES:

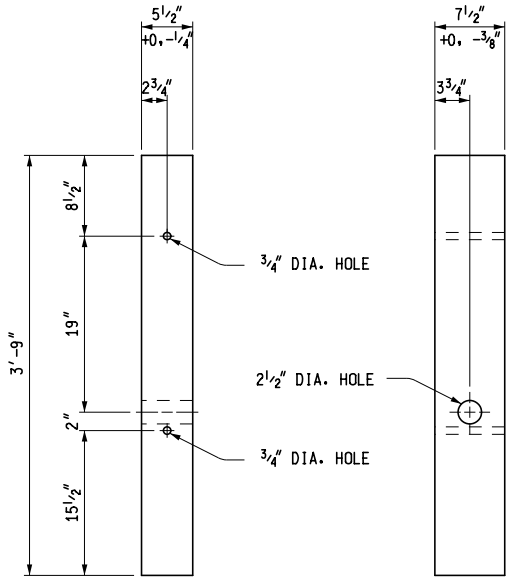
DETAILS ON THIS SHEET ONLY APPLY TO "FLEAT".

AFTER THE CABLE ASSEMBLY HAS BEEN TIGHTENED, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

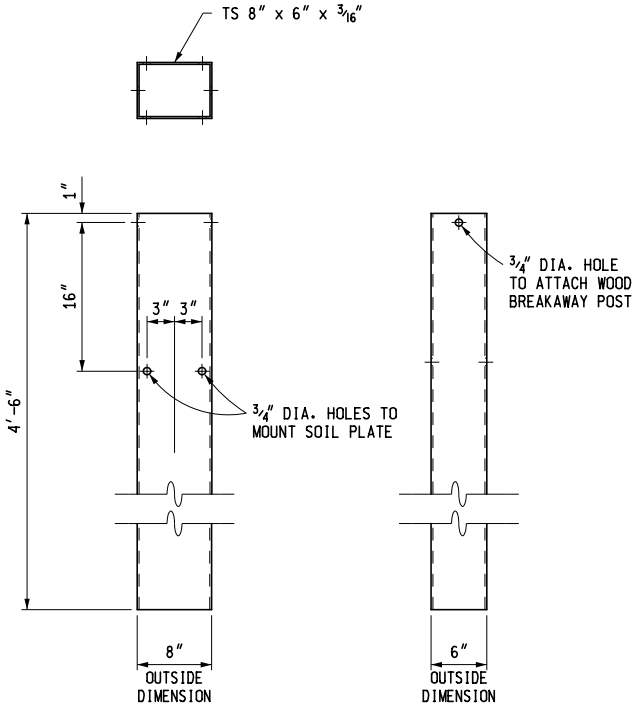
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 10 OF 19

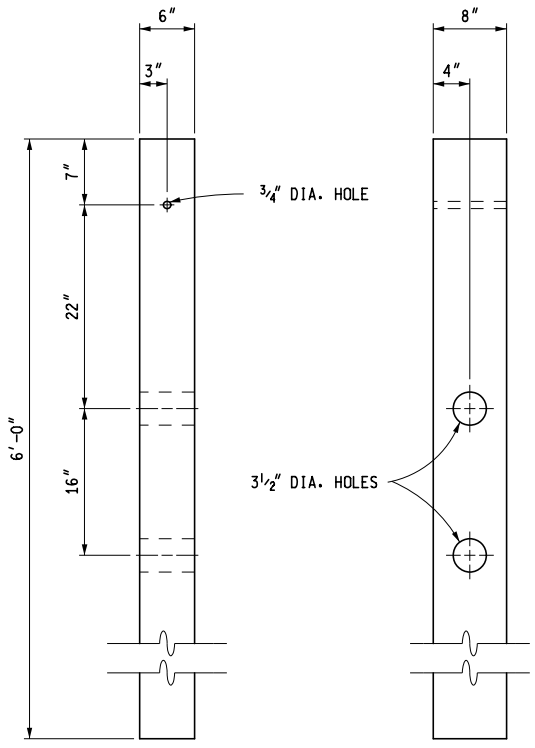


WOOD BREAKAWAY POST

POSTS 1 AND 2 "SRT" AND "FLEAT"

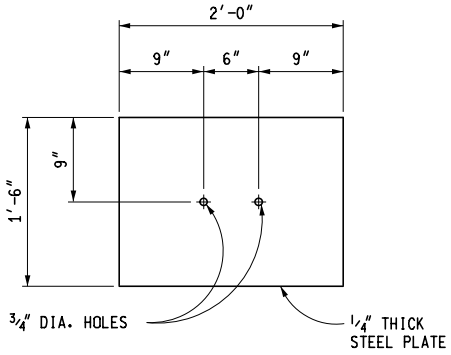


STEEL SLEEVE

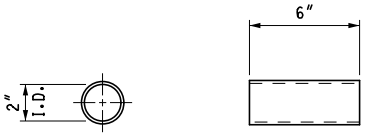


CRT POST

POSTS 3 THROUGH 9 "SRT"
POSTS 3 THROUGH 7 "FLEAT"



SOIL PLATE



POST SLEEVE

(FOR POST 1)

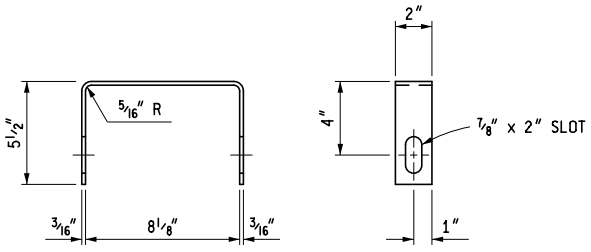
NOTE:

DETAILS ON THIS SHEET ONLY APPLY TO "SRT" AND "FLEAT".

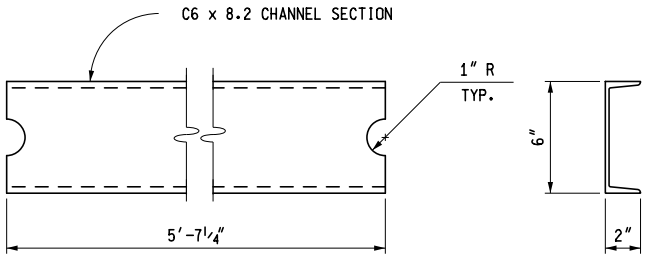
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

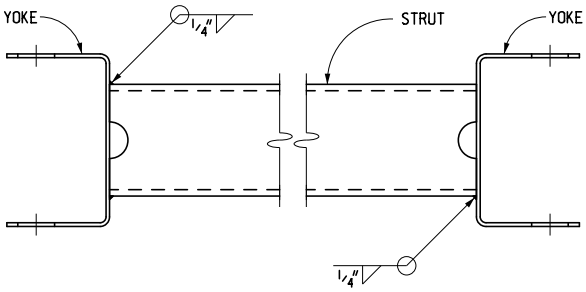
F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 11 OF 19



YOKE DETAIL

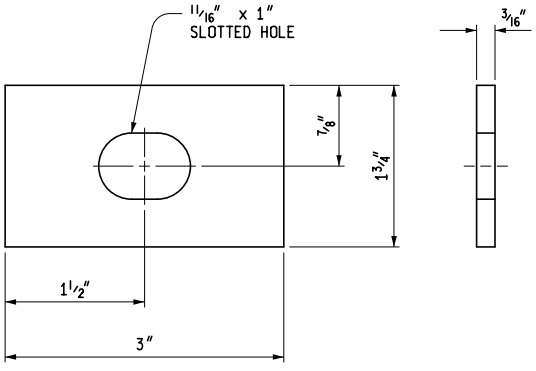


STRUT DETAIL

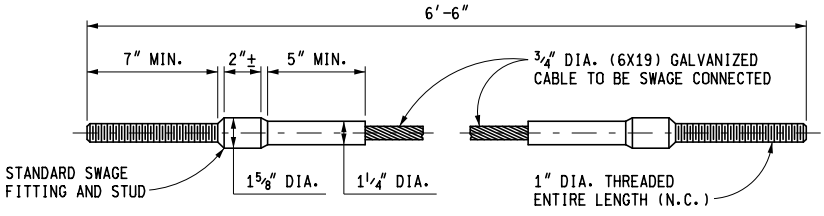


ASSEMBLY DETAIL

STRUT AND YOKE ASSEMBLY



POST BOLT WASHER
(POST 1 ONLY)



CABLE ASSEMBLY

NOTE:

DETAILS ON THIS SHEET ONLY APPLY TO "SRT" AND "FLEAT".

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

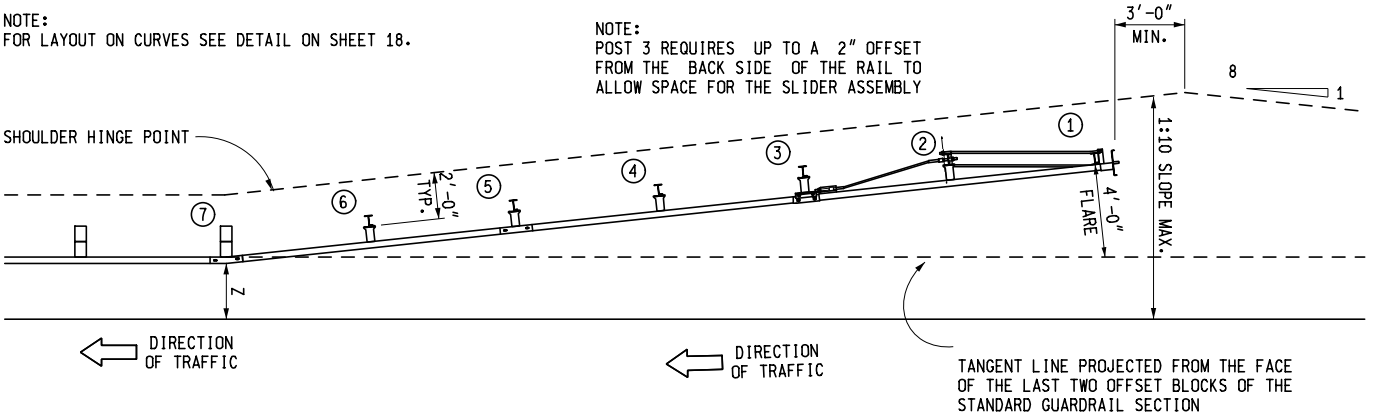
F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 12 OF 19

TRAILING END

APPROACH END

NOTE:
FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 18.

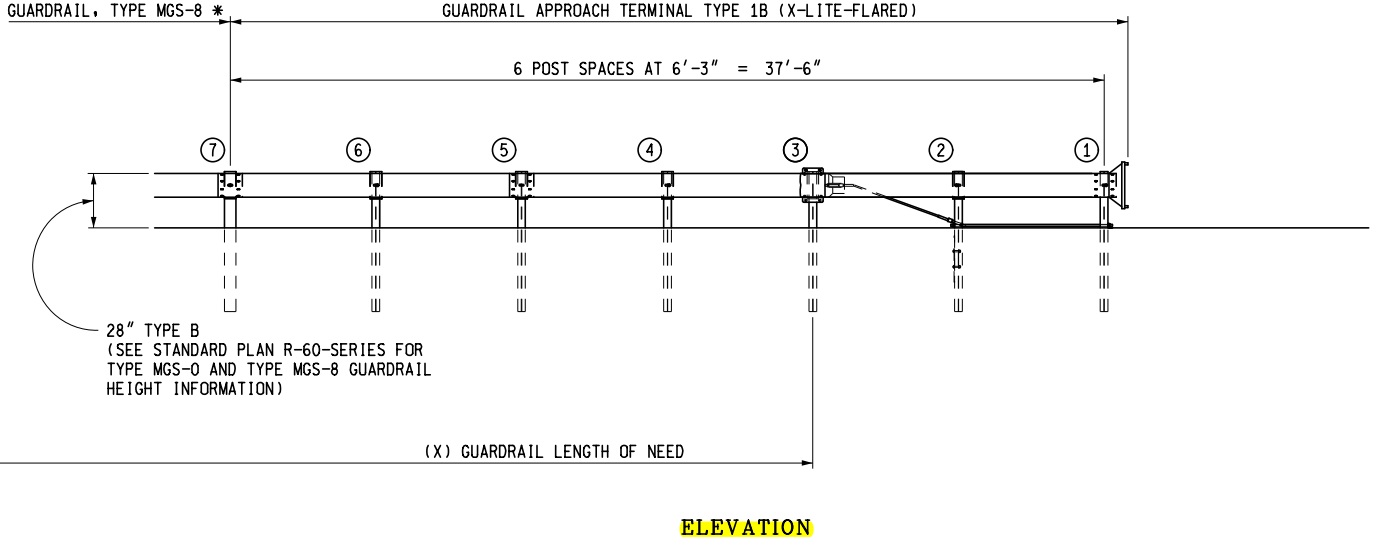
NOTE:
POST 3 REQUIRES UP TO A 2" OFFSET FROM THE BACK SIDE OF THE RAIL TO ALLOW SPACE FOR THE SLIDER ASSEMBLY



PLAN VIEW

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-O AND GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL TYPE 1B

GUARDRAIL, TYPE B
GUARDRAIL, TYPE MGS-O *
GUARDRAIL, TYPE MGS-8 *



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1B "X-LITE-FLARED"

OPTION 3

(DETAILED ON SHEETS 13 THROUGH 17)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

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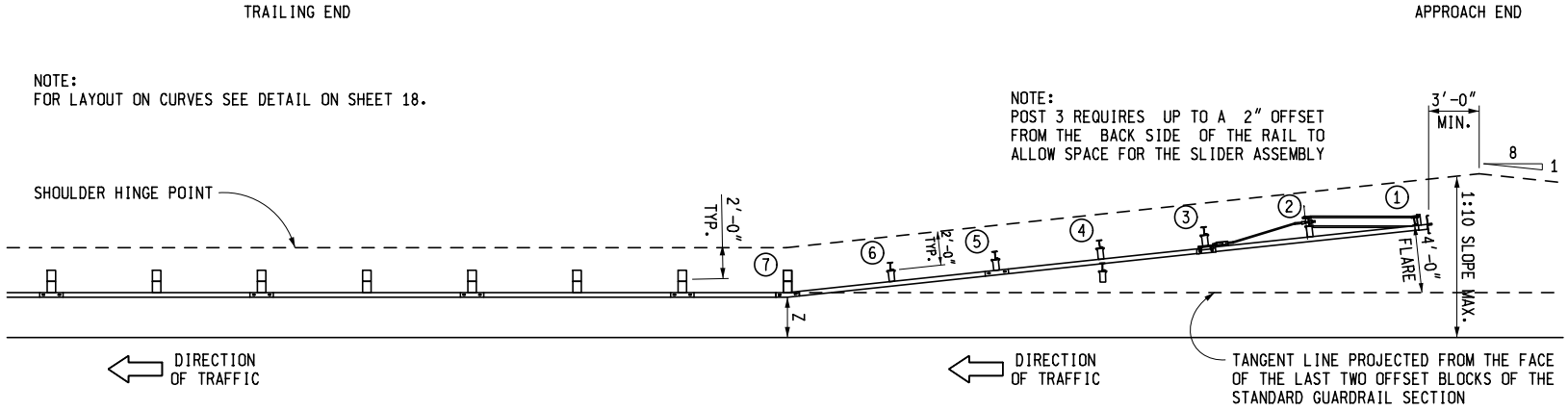
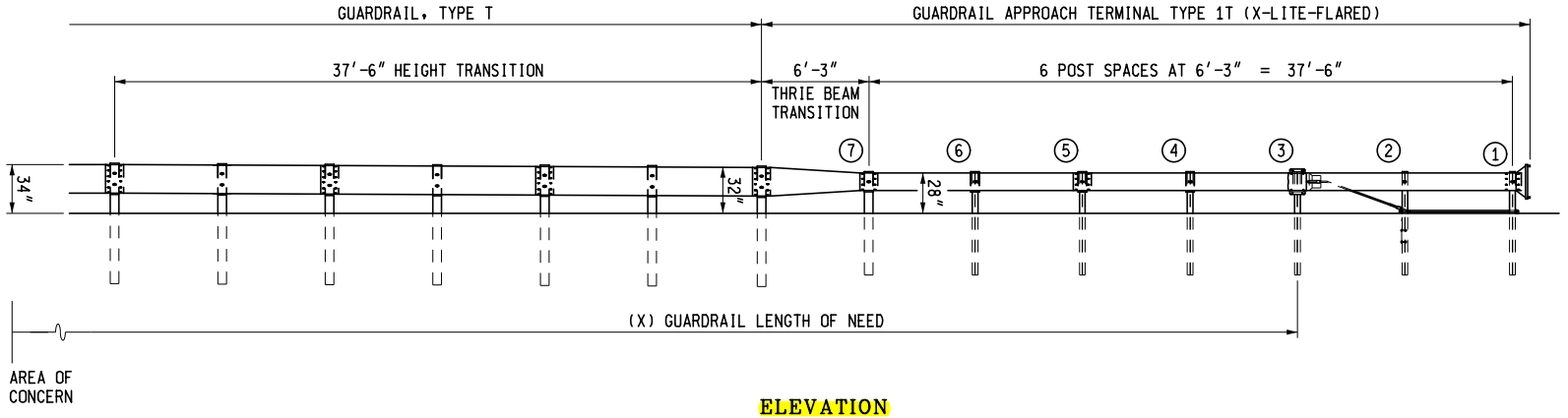


PLAN VIEW



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1T "X-LITE-FLARED"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

2-9-2016
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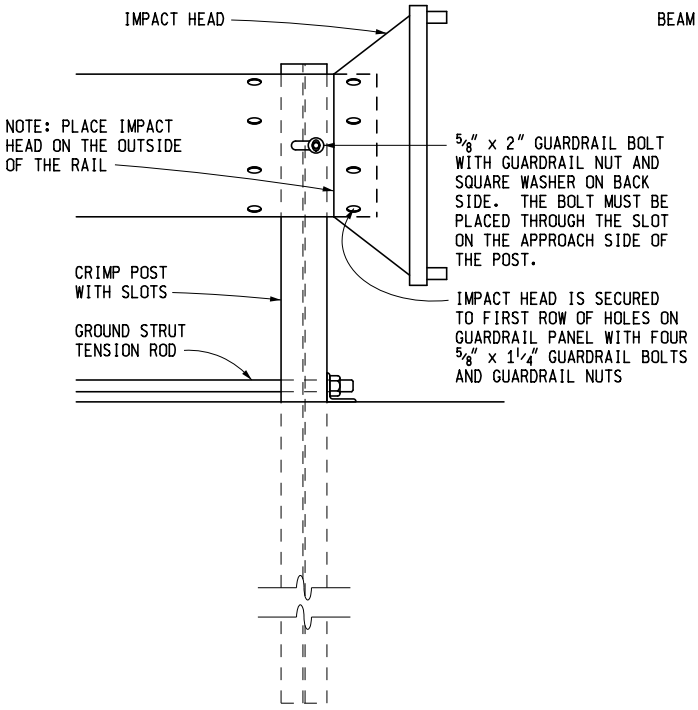
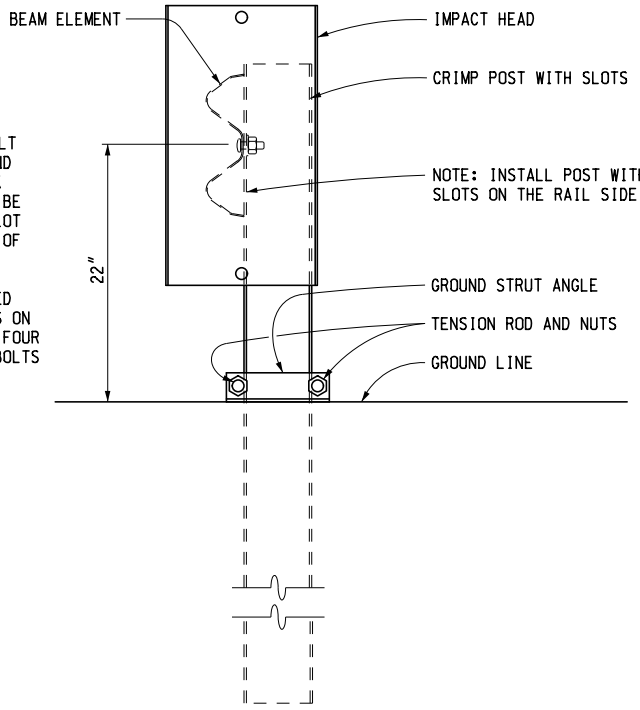
14 OF 19

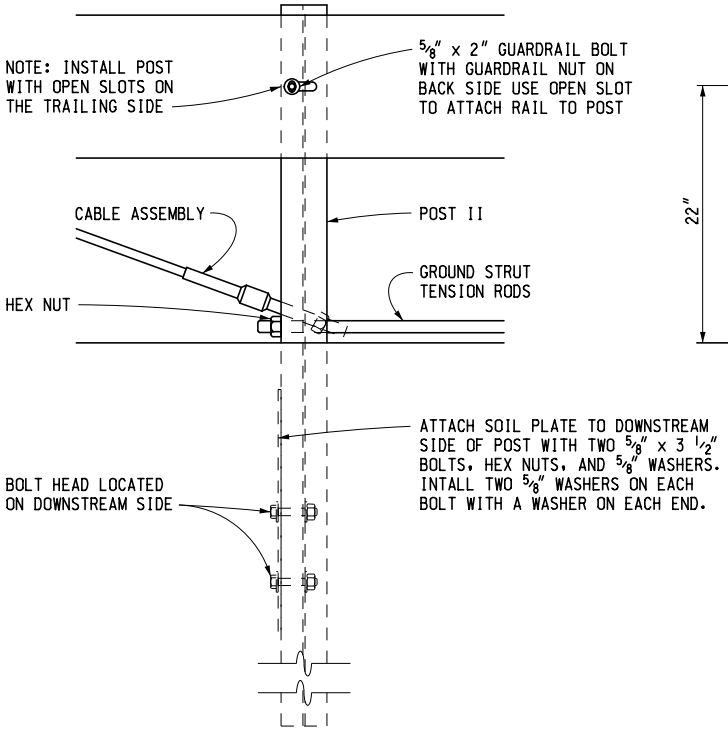


ELEVATION

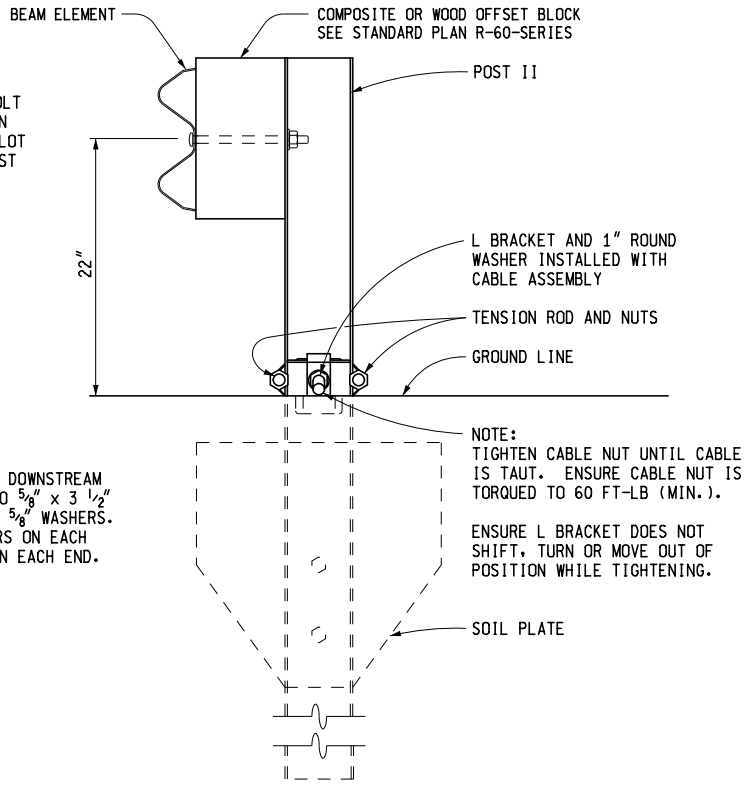


SIDE

POST 1 DETAIL



ELEVATION



SIDE

POST 2 DETAIL

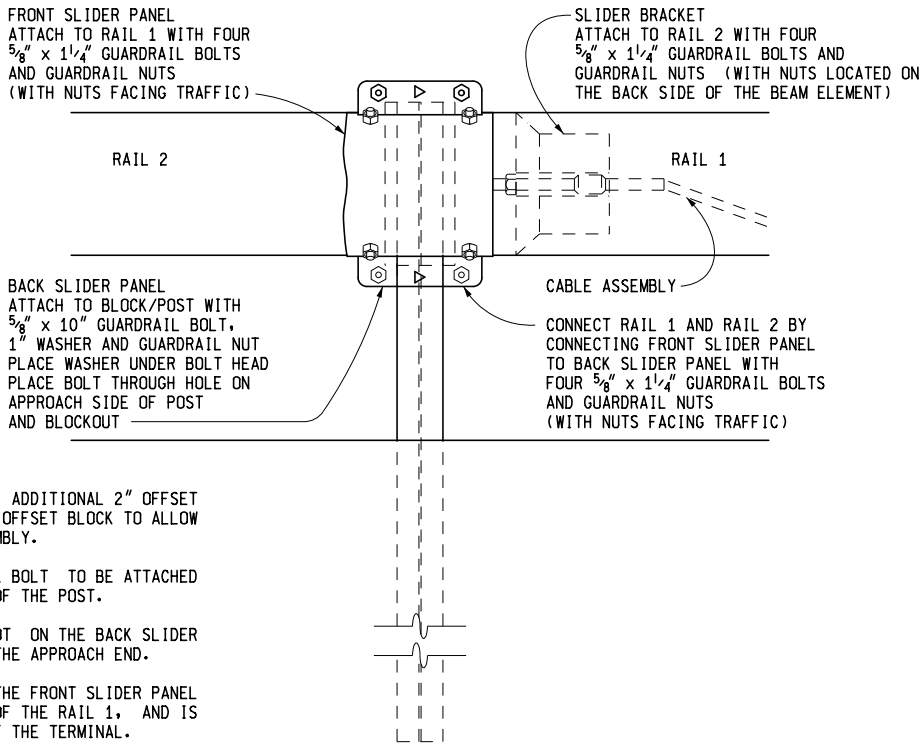
NOTE:

DETAILS ON THIS SHEET ONLY APPLY TO "X-LITE-FLARED".

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 15 OF 19



NOTES:

POST 3 REQUIRES UP TO AN ADDITIONAL 2" OFFSET BETWEEN THE RAIL AND THE OFFSET BLOCK TO ALLOW SPACE FOR THE SLIDER ASSEMBLY.

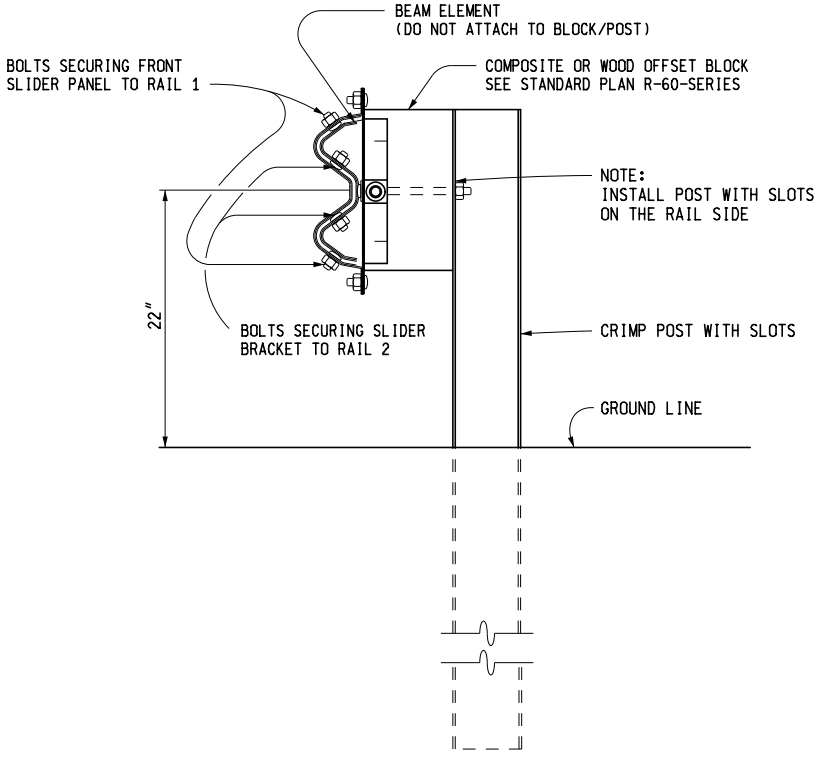
POST 3 REQUIRES GUARDRAIL BOLT TO BE ATTACHED TO SLOT ON TRAILING SIDE OF THE POST.

ENSURE OPEN END OF THE SLOT ON THE BACK SLIDER PANEL IS POINTING TOWARD THE APPROACH END.

ENSURE ANGLED PORTION OF THE FRONT SLIDER PANEL EXTENDS BEYOND THE END OF THE RAIL 1, AND IS FACING THE TRAILING END OF THE TERMINAL.

ARROWS ON FRONT AND BACK SLIDER PANELS NEED TO POINT TOWARD THE APPROACH END OF THE TERMINAL.

ELEVATION



SIDE

POST 3 DETAIL

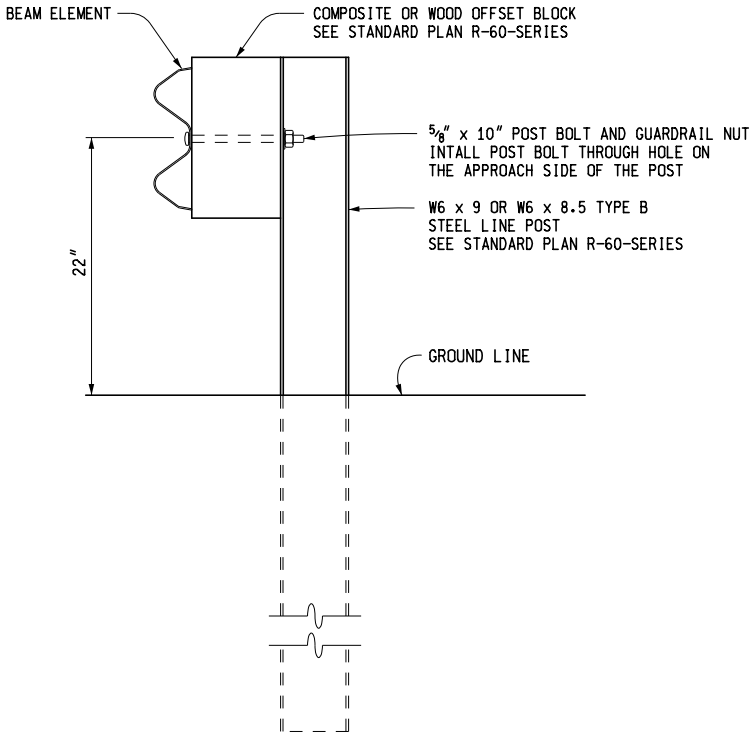
NOTE:

DETAILS ON THIS SHEET ONLY APPLY TO "X-LITE-FLARED".

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

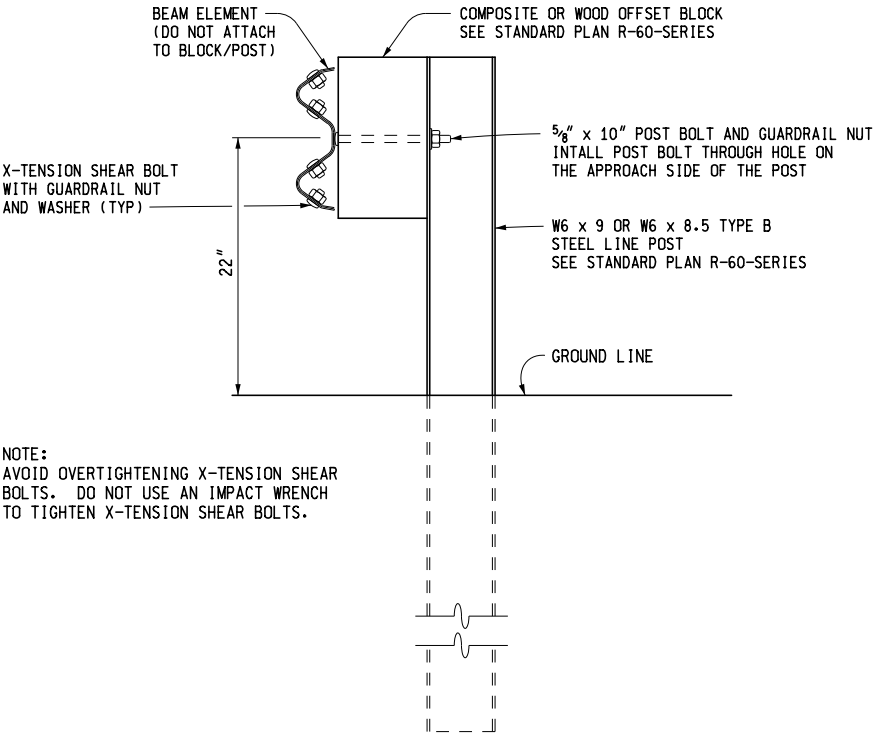
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 16 OF 19



POST 4 AND 6 DETAIL

NOTE:
OVERLAP BEAM ELEMENTS WITH ELEMENTS
ON THE APPROACH END OVER ELEMENTS
ON THE TRAILING END.



NOTE:
AVOID OVERTIGHTENING X-TENSION SHEAR
BOLTS. DO NOT USE AN IMPACT WRENCH
TO TIGHTEN X-TENSION SHEAR BOLTS.

POST 5

NOTE:
POST 7 IS A STANDARD LINE POST.

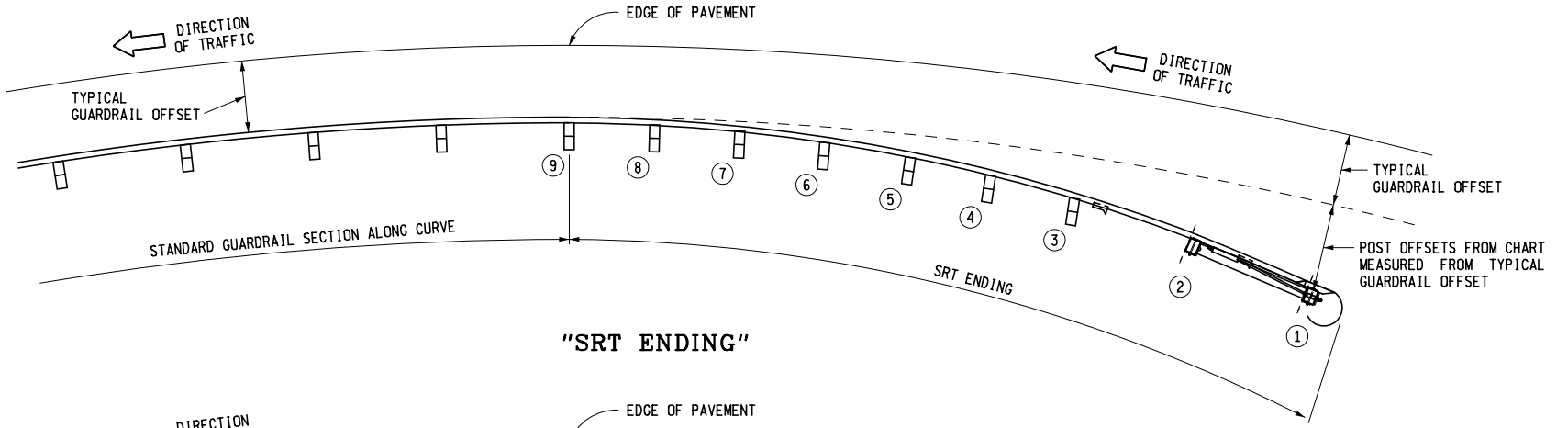
NOTE:

DETAILS ON THIS SHEET ONLY APPLY TO "X-LITE-FLARED".

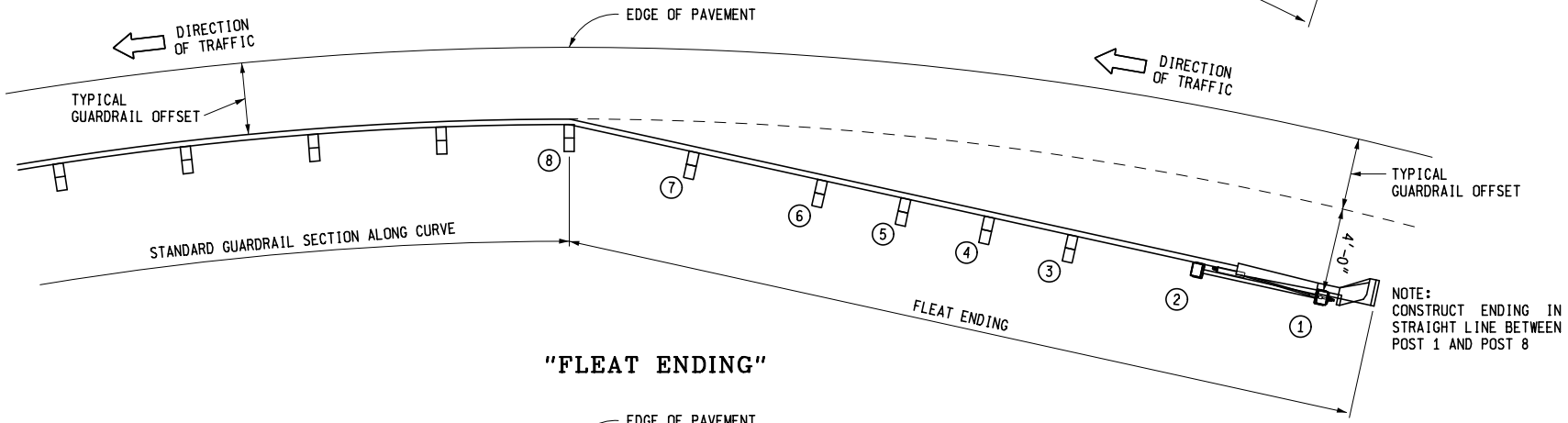
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

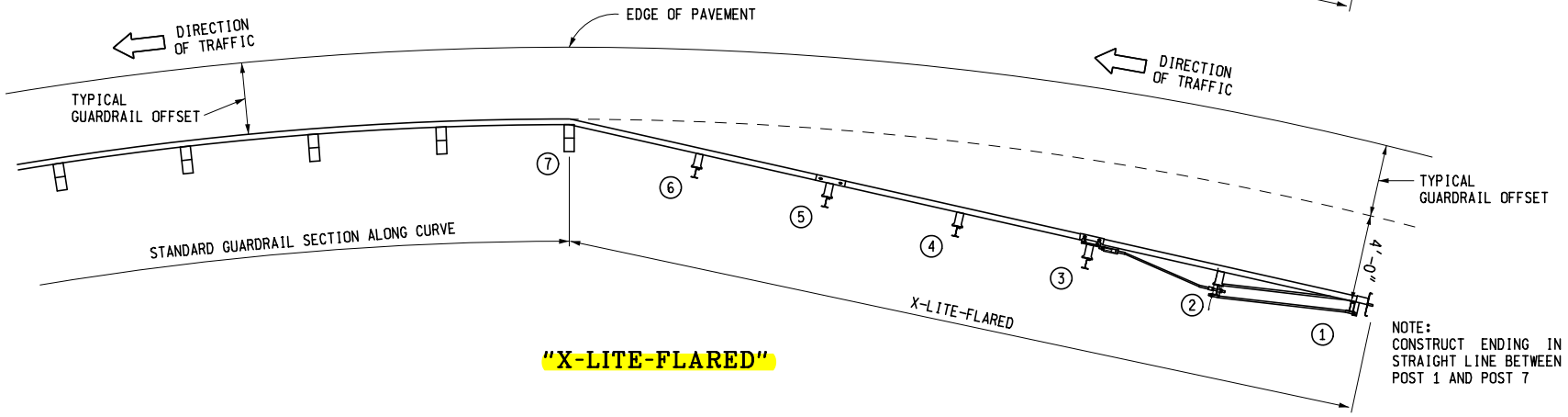
F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 17 OF 19



"SRT ENDING"



"FLEAT ENDING"



"X-LITE-FLARED"

LOCATION OF APPROACH GUARDRAIL ON CURVES

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

2-9-2016
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18 OF 19

NOTES:

ALL POSTS, OFFSET BLOCKS, BEAM ELEMENTS, AND HARDWARE (INCLUDING BOLTS, NUTS, AND WASHERS) SHALL CONFORM TO THE CURRENT STANDARD SPECIFICATIONS AND TO THE CURRENT STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT AS SPECIFIED ON THIS STANDARD.

ALL 1:10 SLOPES SHALL BE GRADED TO CLASS A SLOPE TOLERANCES.

GUARDRAIL REFLECTORS ARE NOT TO BE USED ON THE GUARDRAIL APPROACH TERMINAL. PLACE REFLECTORS BEGINNING ON STANDARD RUN OF GUARDRAIL.

USE REFLECTIVE SHEETING ACCORDING TO THE FOLLOWING TRAFFIC CONDITIONS:
(NOTE: ALTERNATE 3" BLACK AND 3" YELLOW STRIPES ON A 45° ANGLE)

TRAFFIC PASSING ON THE LEFT SIDE

TRAFFIC PASSING ON BOTH SIDES

TRAFFIC PASSING ON THE RIGHT SIDE

ON THE "SRT", THE CURVED PORTION OF THE TERMINAL END SHOE FACING TRAFFIC (HALF CIRCLE) SHALL BE COMPLETELY COVERED WITH HIGH INTENSITY ADHESIVE REFLECTIVE SHEETING.

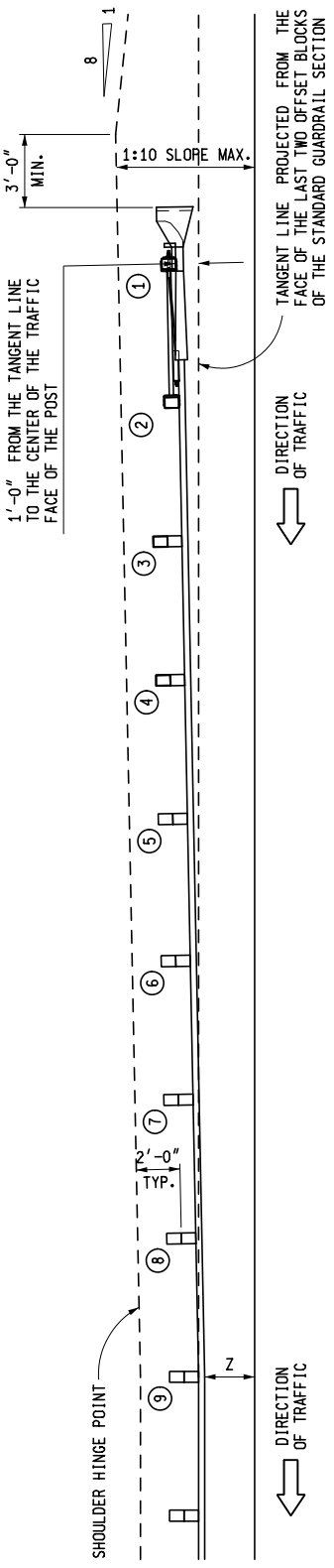
ON THE "FLEAT" AND "X-LITE-FLARED", THE PORTION OF THE IMPACT HEAD ASSEMBLY FACING TRAFFIC SHALL BE COMPLETELY COVERED WITH HIGH INTENSITY ADHESIVE REFLECTIVE SHEETING.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

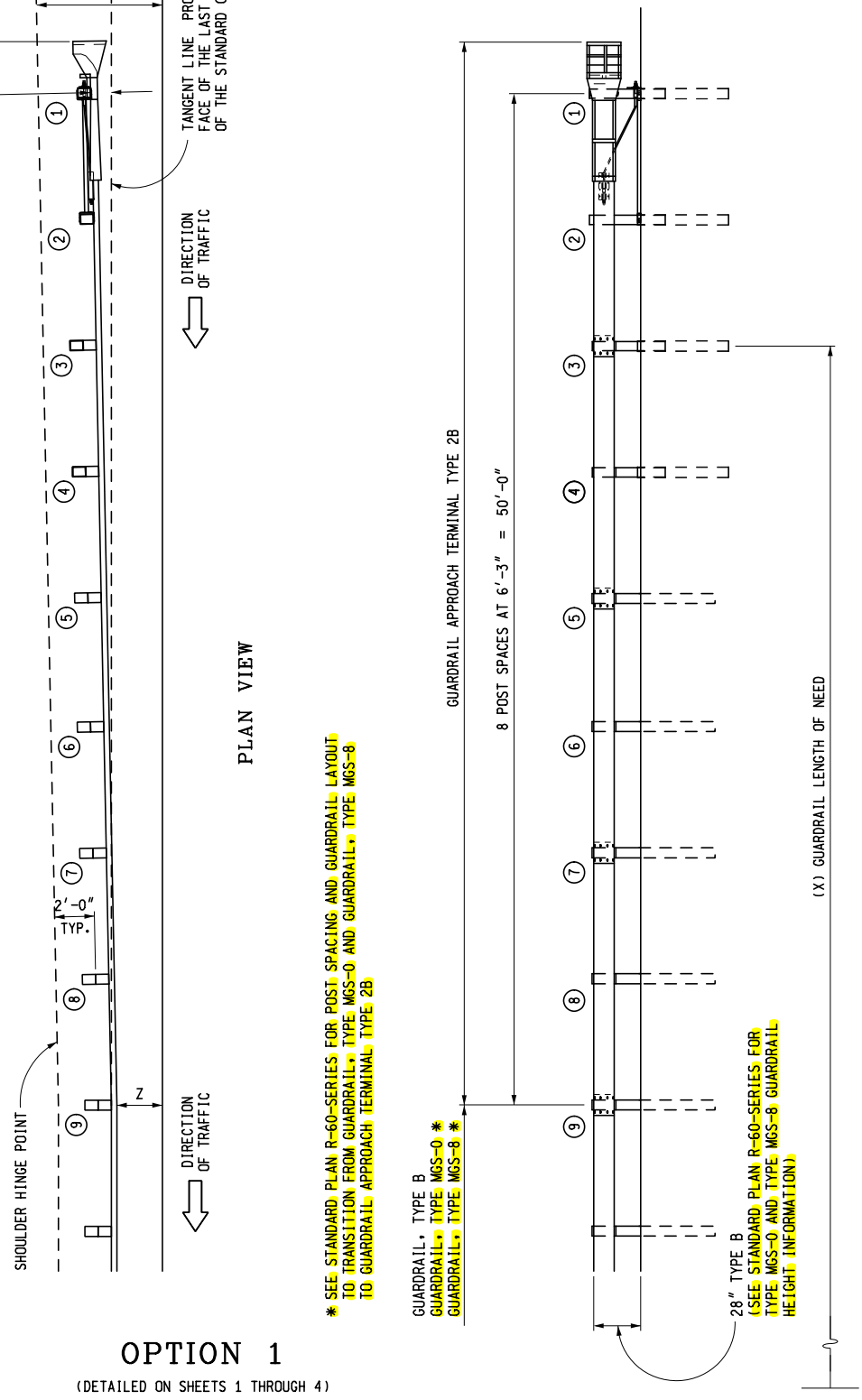
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-9-2016 PLAN DATE	R-61-H	SHEET 19 OF 19



PLAN VIEW

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-O AND GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL TYPE 2B



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 2B "SKT"

OPTION 1

(DETAILED ON SHEETS 1 THROUGH 4)

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

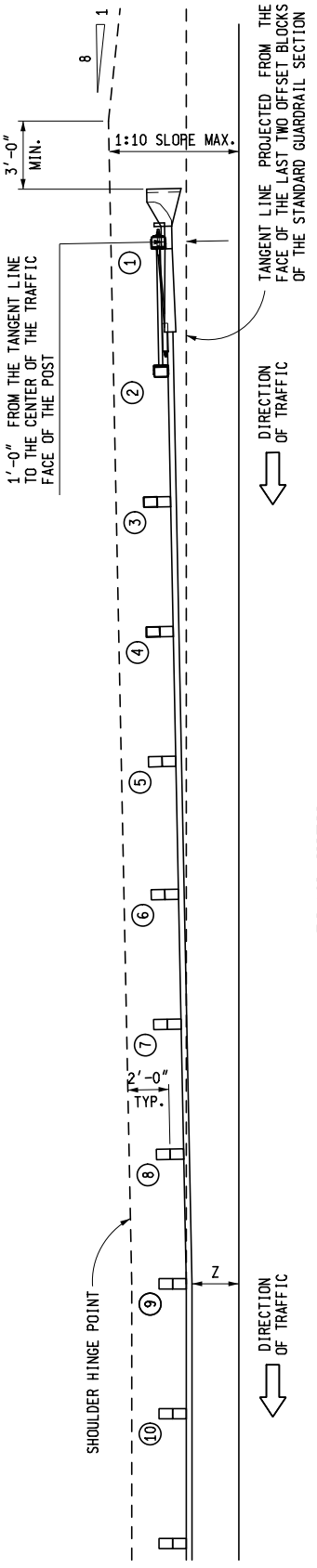
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

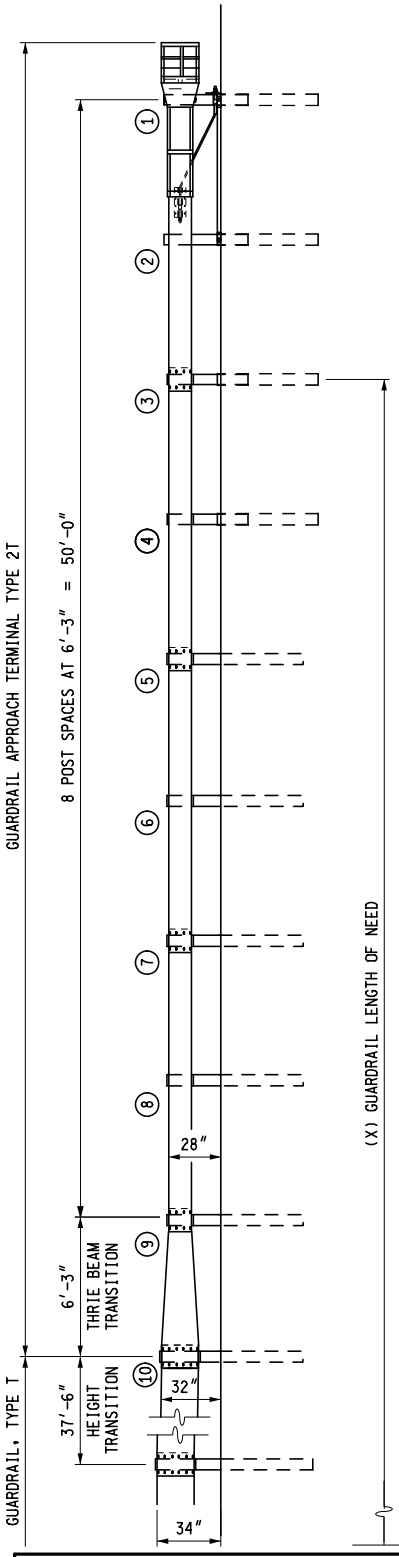
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-LITE-TANGENT-50)

F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	R-62-H	SHEET 1 OF 10



PLAN VIEW



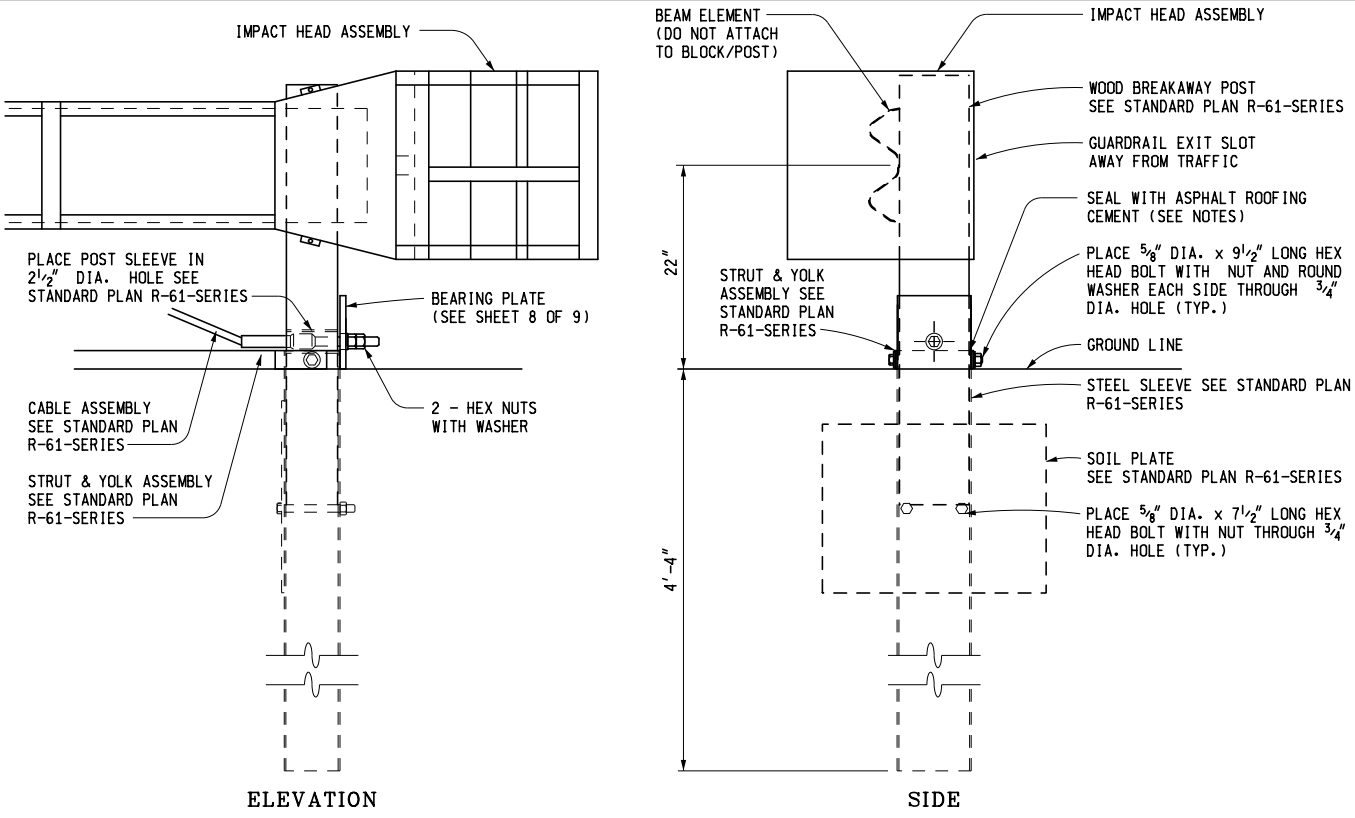
ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 2T "SKT"

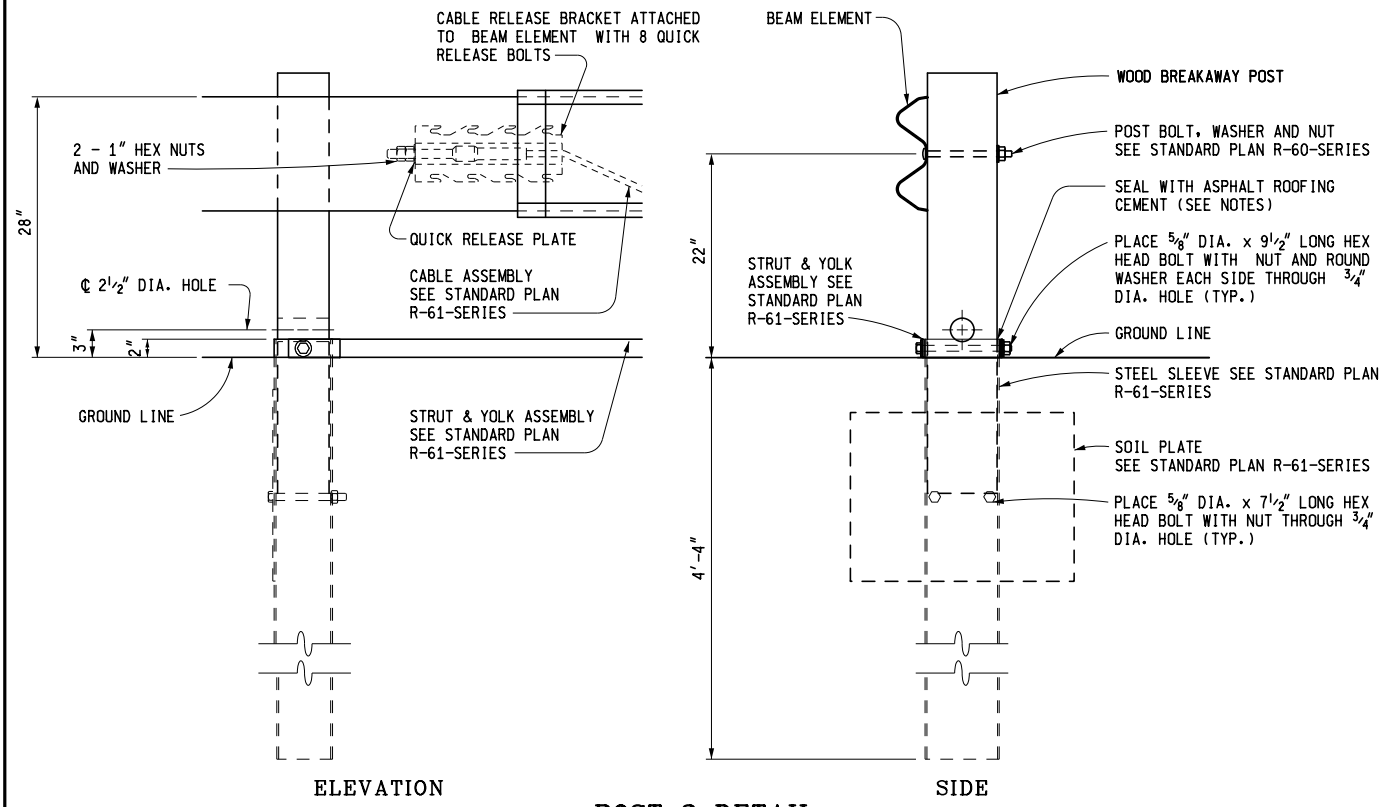
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-LITE-TANGENT-50)

F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	R-62-H	SHEET 2 OF 10



POST 1 DETAIL



POST 2 DETAIL

NOTE:

THE BREAKAWAY CABLE ASSEMBLY MUST BE TAUT. A LOCKING DEVICE (VICE GRIPS OR CHANNEL LOCK PLIERS) SHOULD BE USED TO PREVENT THE CABLE FROM TWISTING WHEN TIGHTENING THE NUTS.

AFTER THE CABLE ASSEMBLY HAS BEEN TIGHTENED, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

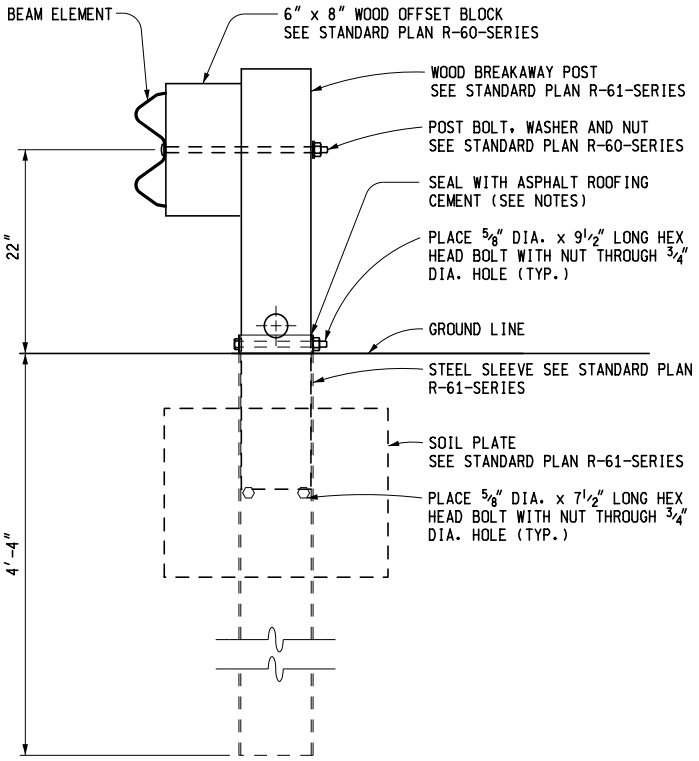
ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

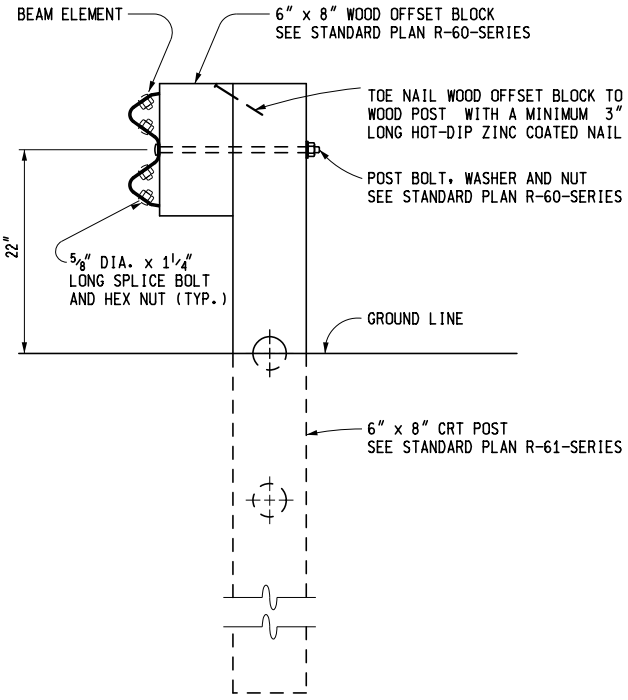
GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-LITE-TANGENT-50)

F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	R-62-H	SHEET 3 OF 10

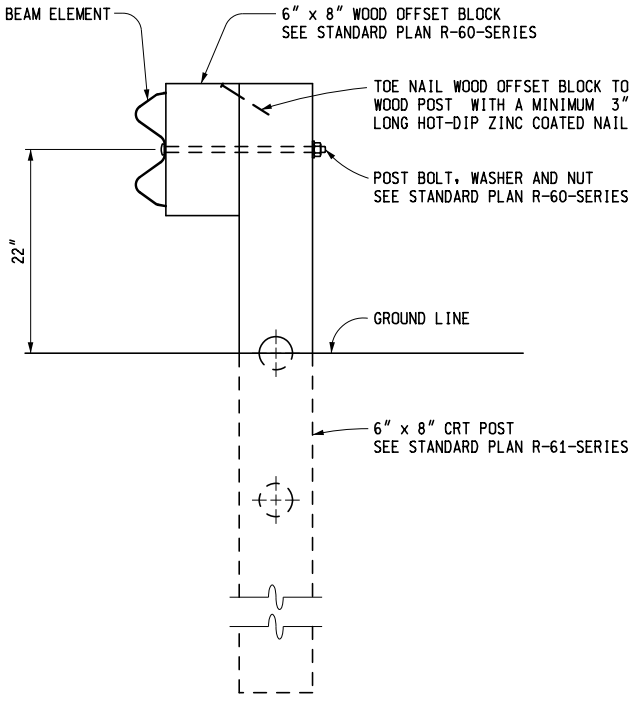


POST 3 AND 4 DETAIL

NOTE: BEAM ELEMENTS ARE SPLICED TOGETHER AT POST 3

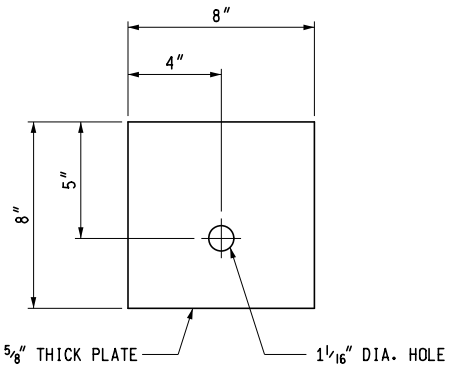


POST 5 AND 7 DETAIL



POST 6 AND 8 DETAIL

NOTE: POST 9 IS A STANDARD LINE POST.



BEARING PLATE

NOTE:

ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

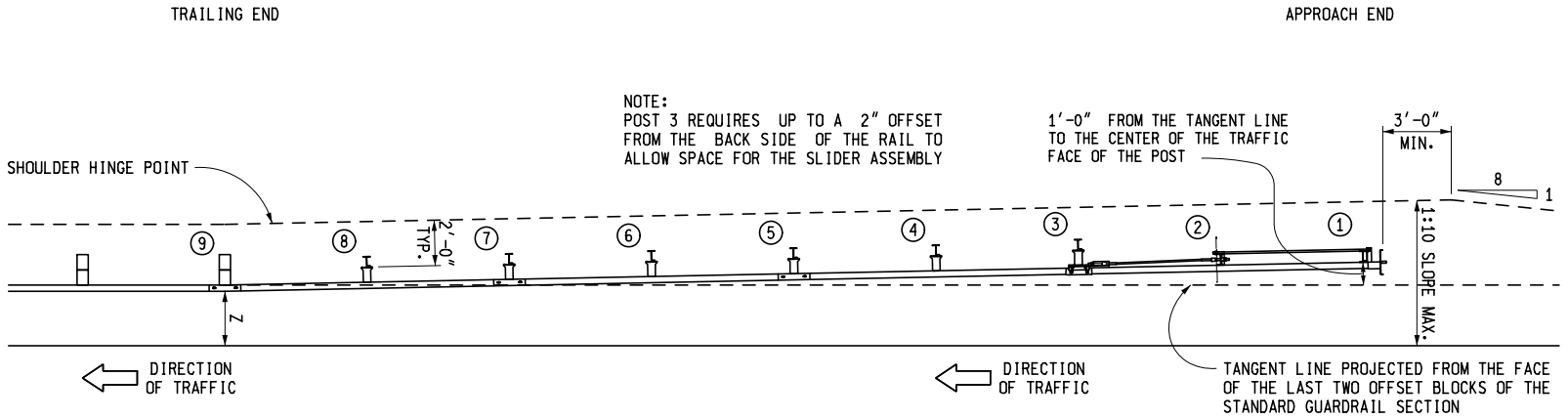
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-LITE-TANGENT-50)

F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	R-62-H	SHEET 4 OF 10

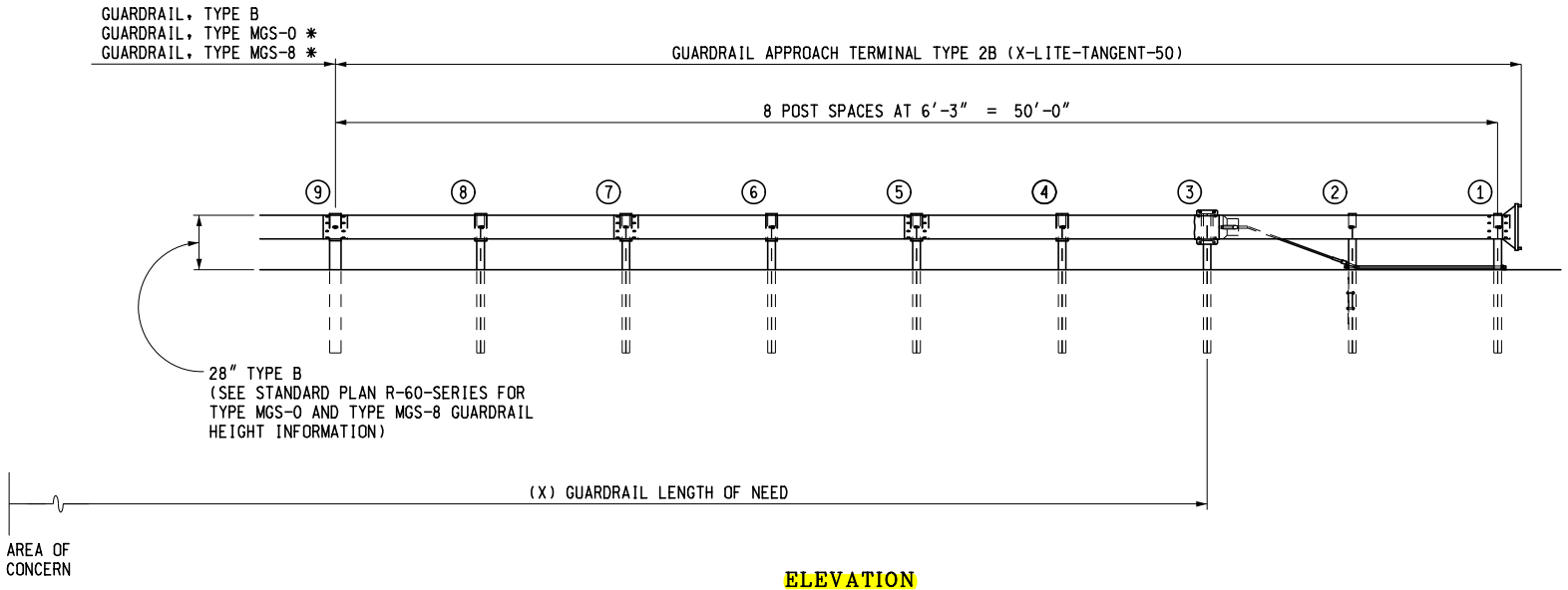
OPTION 2

(DETAILED ON SHEETS 5 THROUGH 9)



PLAN VIEW

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-O AND GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL TYPE 2B



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 2B "X-LITE-TANGENT-50"

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

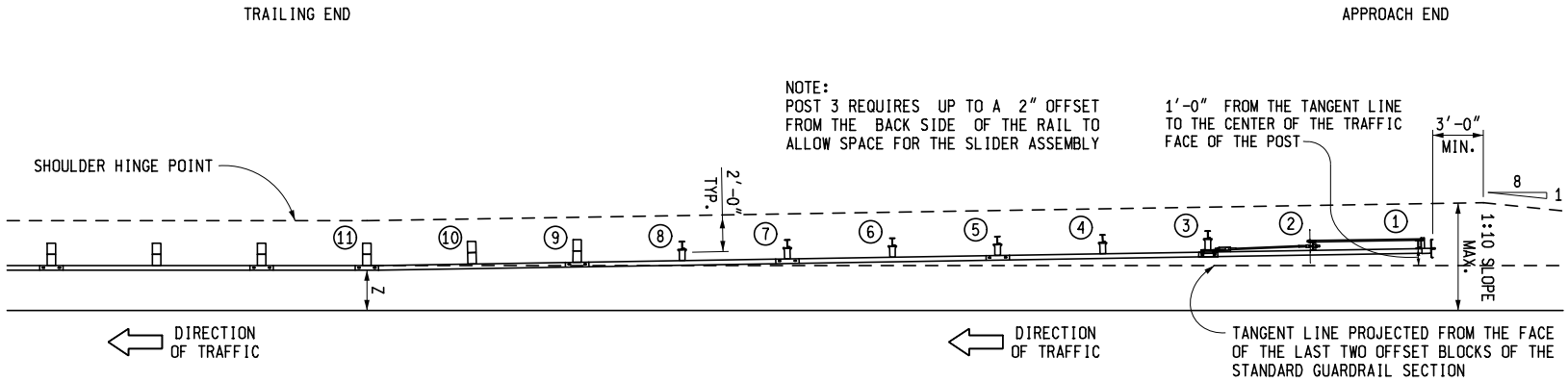
GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-LITE-TANGENT-50)

F.H.W.A. APPROVAL

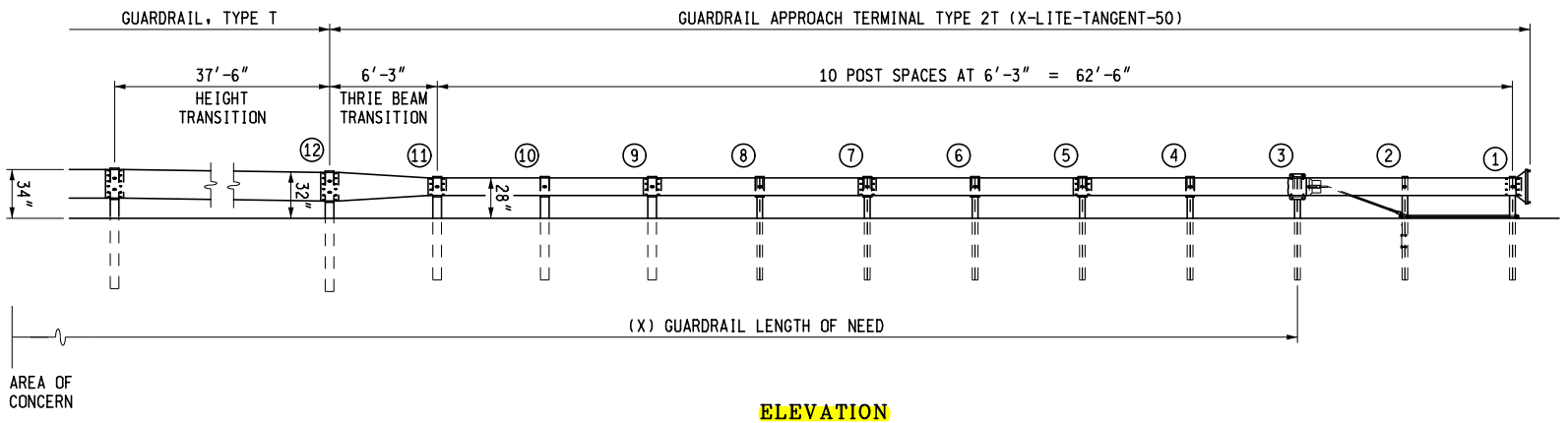
2-4-2016
PLAN DATE

R-62-H

SHEET
5 OF 10



PLAN VIEW



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 2T "X-LITE-TANGENT-50"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

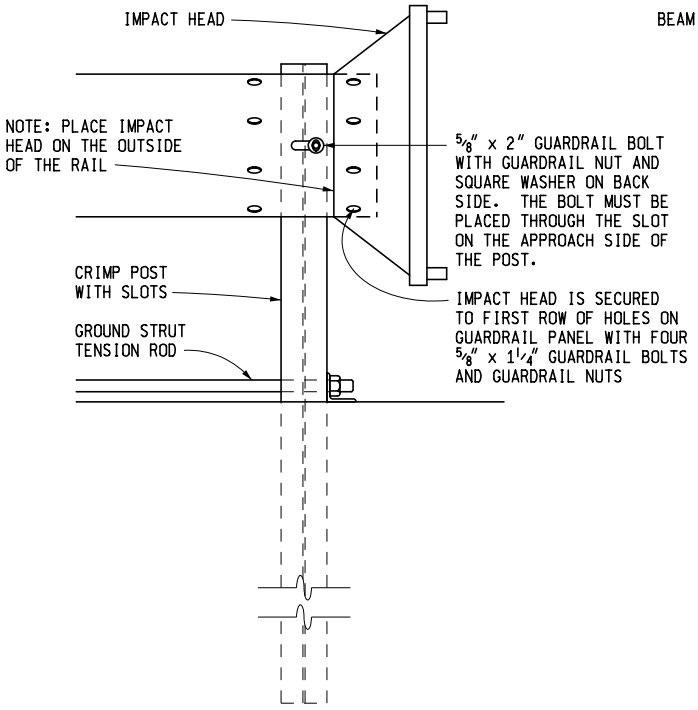
GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-LITE-TANGENT-50)

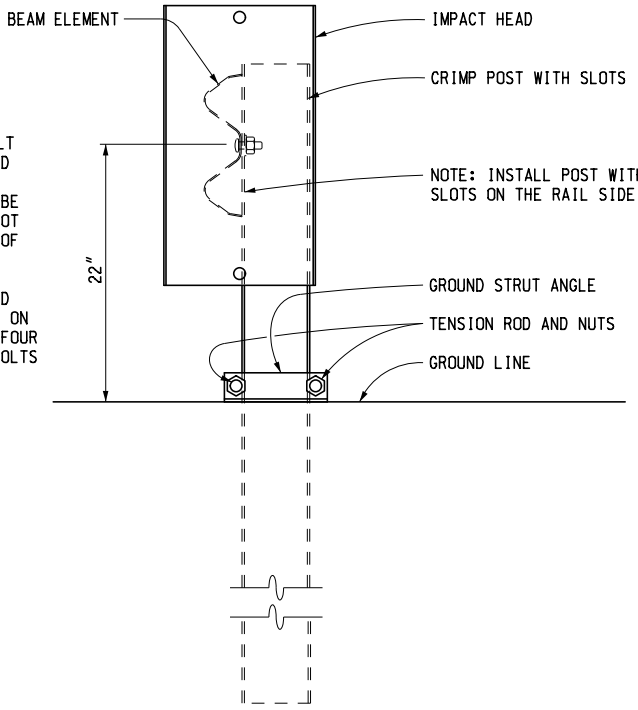
F.H.W.A. APPROVAL

2-4-2016
PLAN DATE

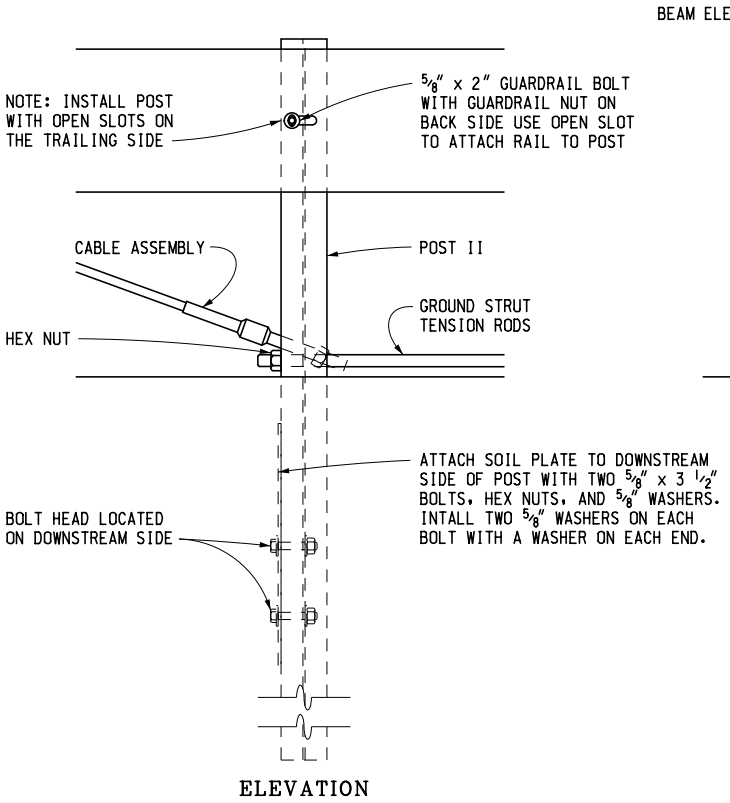
R-62-H

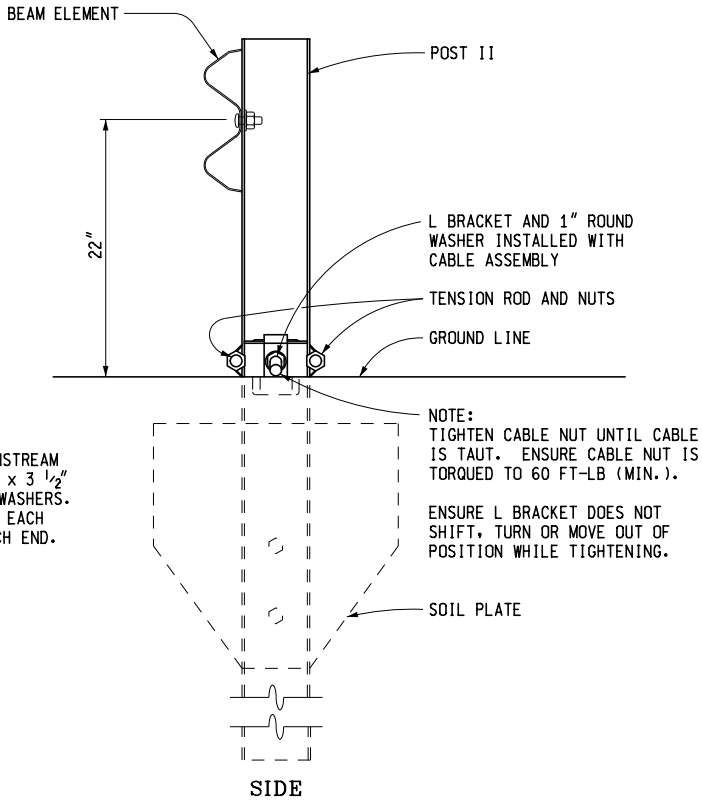
SHEET 6 OF 10





POST 1 DETAIL





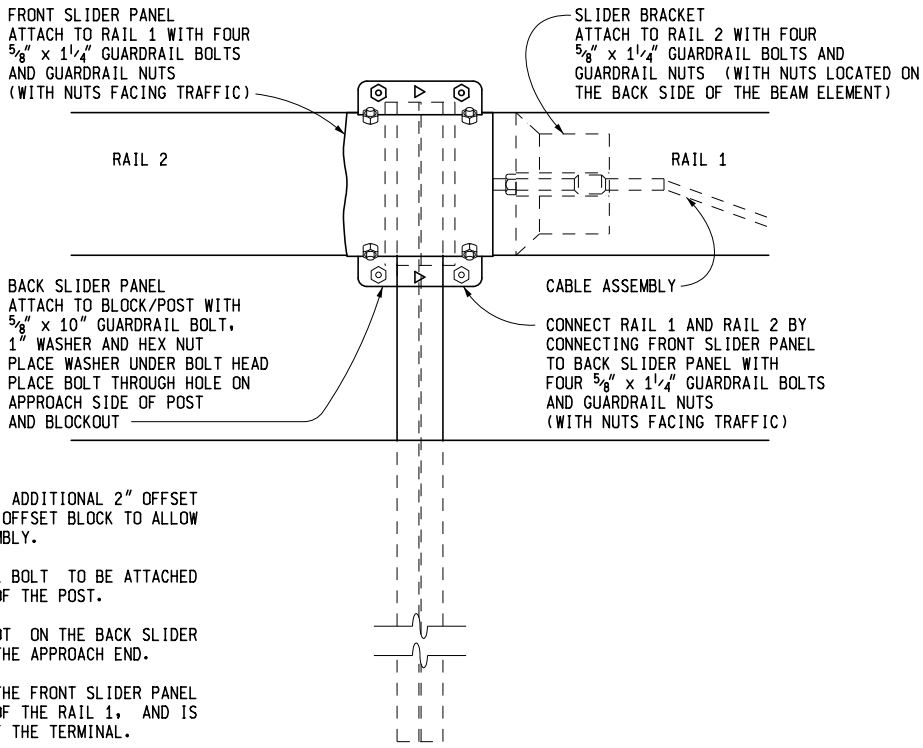
POST 2 DETAIL

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-LITE-TANGENT-50)

F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	R-62-H	SHEET 7 OF 10



NOTES:

POST 3 REQUIRES UP TO AN ADDITIONAL 2" OFFSET BETWEEN THE RAIL AND THE OFFSET BLOCK TO ALLOW SPACE FOR THE SLIDER ASSEMBLY.

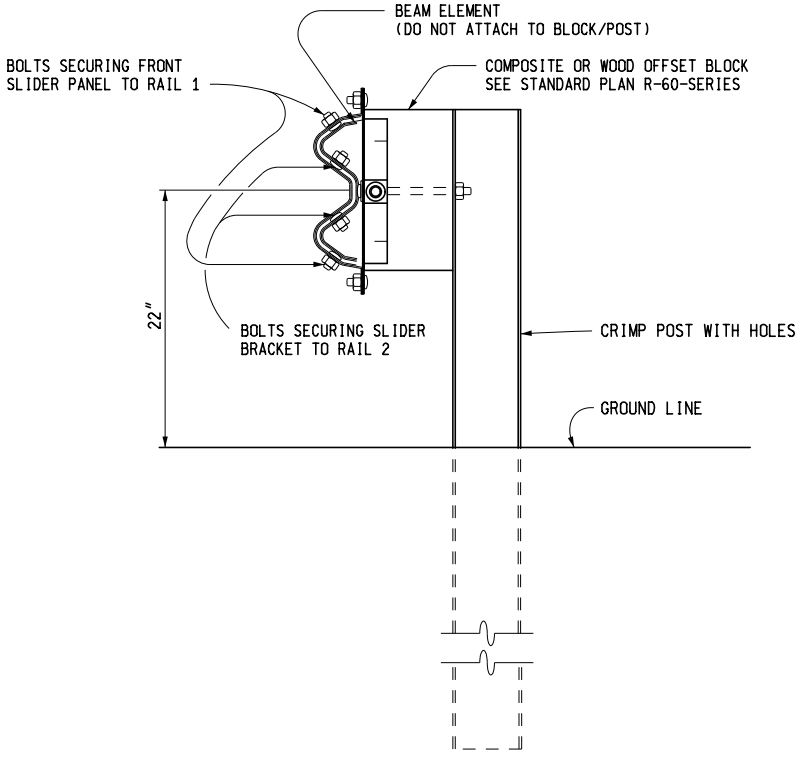
POST 3 REQUIRES GUARDRAIL BOLT TO BE ATTACHED TO HOLE ON APPROACH SIDE OF THE POST.

ENSURE OPEN END OF THE SLOT ON THE BACK SLIDER PANEL IS POINTING TOWARD THE APPROACH END.

ENSURE ANGLED PORTION OF THE FRONT SLIDER PANEL EXTENDS BEYOND THE END OF THE RAIL 1, AND IS FACING THE TRAILING END OF THE TERMINAL.

ARROWS ON FRONT AND BACK SLIDER PANELS NEED TO POINT TOWARD THE APPROACH END OF THE TERMINAL.

ELEVATION



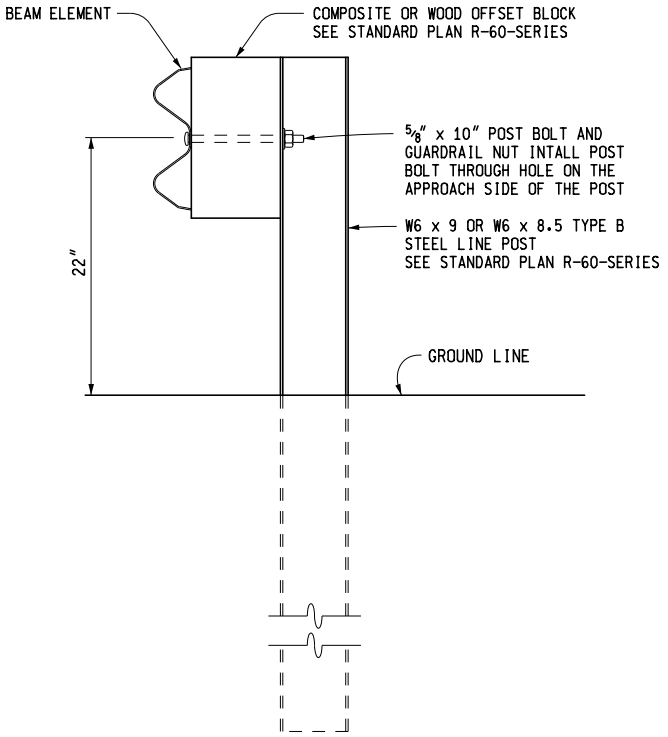
SIDE

POST 3 DETAIL

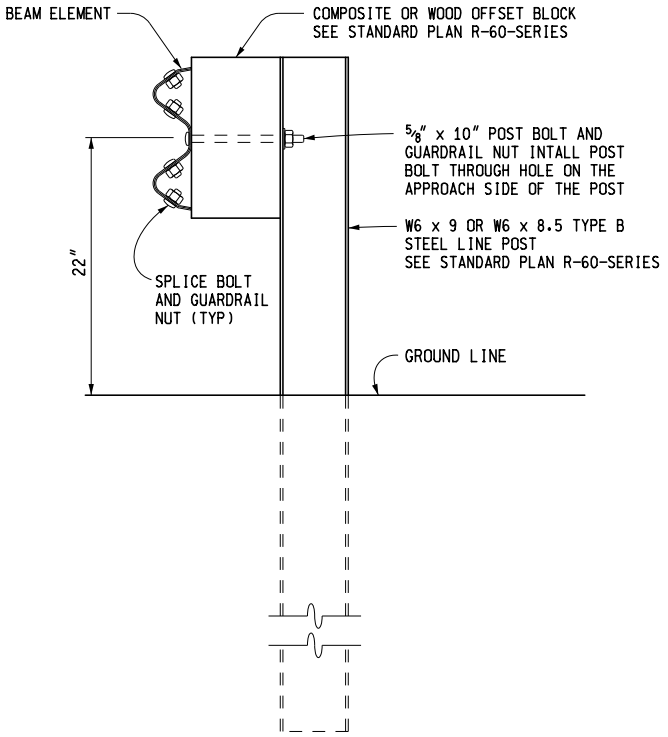
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-LITE-TANGENT-50)

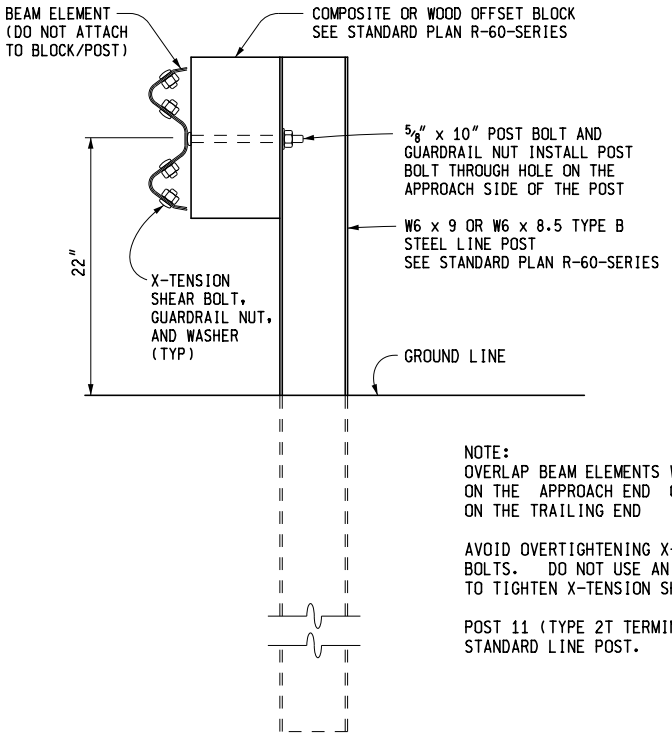
F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	R-62-H	SHEET 8 OF 10



POST 4, 6, AND 8 DETAIL
POST 10 DETAIL (TYPE 2T TERMINAL ONLY)



POST 9 DETAIL

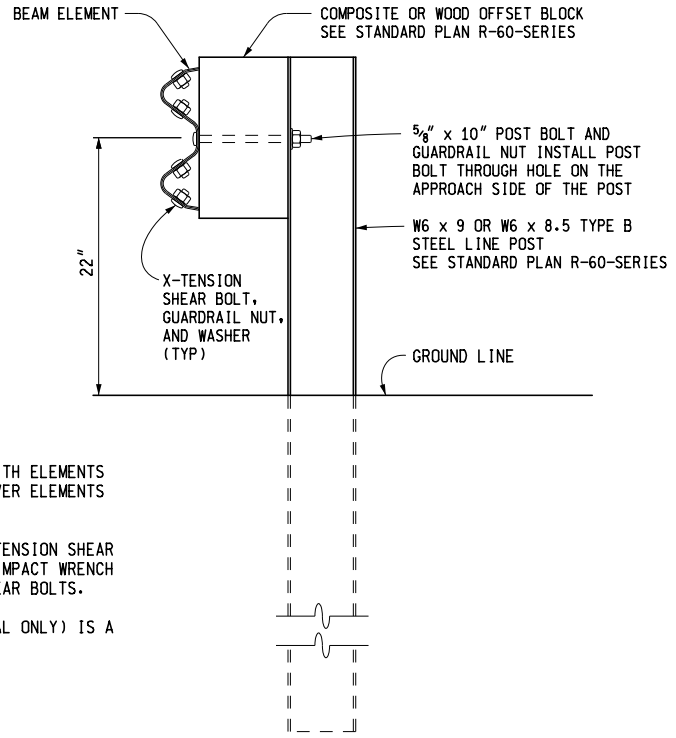


POST 5 DETAIL

NOTE:
OVERLAP BEAM ELEMENTS WITH ELEMENTS ON THE APPROACH END OVER ELEMENTS ON THE TRAILING END

AVOID OVERTIGHTENING X-TENSION SHEAR BOLTS. DO NOT USE AN IMPACT WRENCH TO TIGHTEN X-TENSION SHEAR BOLTS.

POST 11 (TYPE 2T TERMINAL ONLY) IS A STANDARD LINE POST.



POST 7 DETAIL

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-LITE-TANGENT-50)

F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	R-62-H	SHEET 9 OF 10

NOTES:

ALL POSTS, OFFSET BLOCKS, BEAM ELEMENTS, AND HARDWARE (INCLUDING BOLTS, NUTS, AND WASHERS) SHALL CONFORM TO THE CURRENT STANDARD SPECIFICATIONS AND TO THE CURRENT STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT AS SPECIFIED ON THIS STANDARD.

ALL 1:10 SLOPES SHALL BE GRADED TO CLASS A SLOPE TOLERANCES.

WHEN SITE CONDITIONS WARRANT AND WITH THE APPROVAL OF THE ENGINEER, GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T CAN BE INSTALLED STRAIGHT (WITHOUT THE 1'-0" OFFSET FROM THE TANGENT LINE TO THE TRAFFIC FACE OF POST 1).

GUARDRAIL REFLECTORS ARE NOT TO BE USED ON THE GUARDRAIL APPROACH TERMINAL. PLACE REFLECTORS BEGINNING ON STANDARD RUN OF GUARDRAIL.

USE REFLECTIVE SHEETING ACCORDING TO THE FOLLOWING TRAFFIC CONDITIONS: (NOTE: ALTERNATE 3" BLACK AND 3" YELLOW STRIPES ON A 45° ANGLE)

TRAFFIC PASSING ON THE LEFT SIDE

TRAFFIC PASSING ON BOTH SIDES

TRAFFIC PASSING ON THE RIGHT SIDE

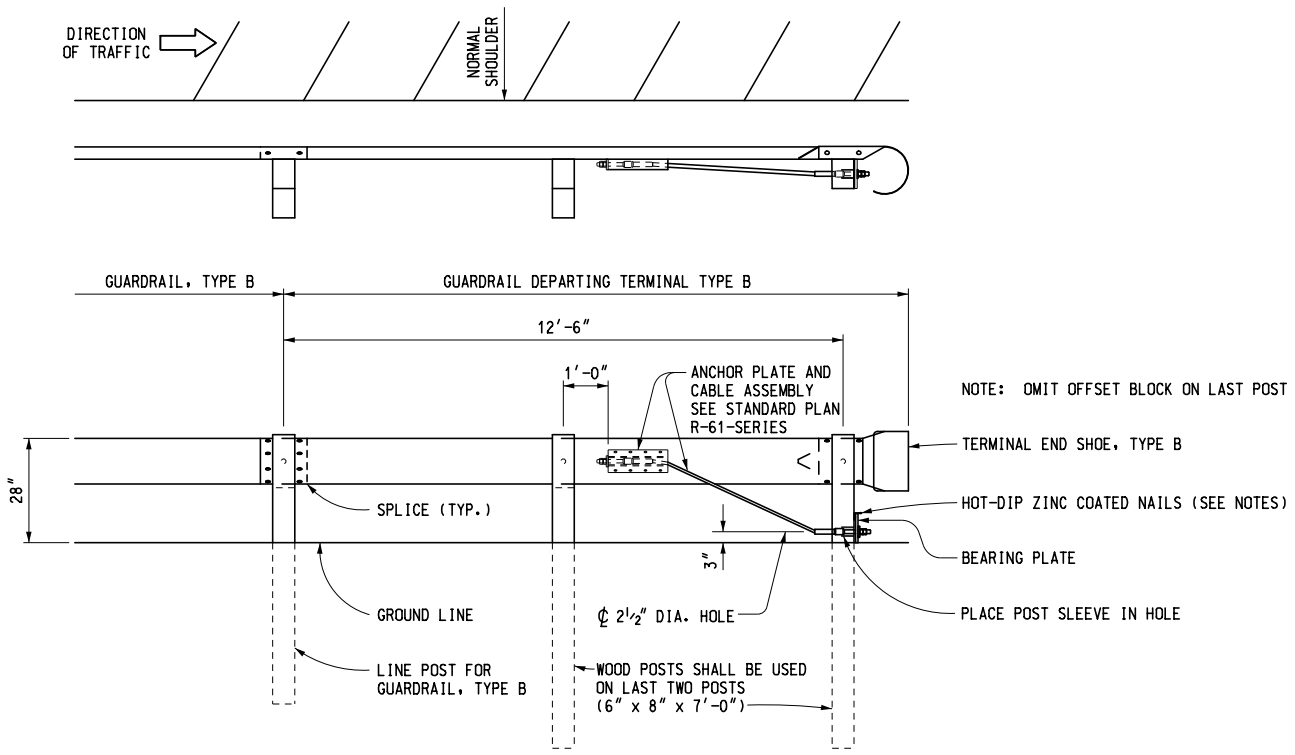
THE PORTION OF THE IMPACT HEAD ASSEMBLY FACING TRAFFIC SHALL BE COMPLETELY COVERED WITH HIGH INTENSITY ADHESIVE REFLECTIVE SHEETING.

MICHIGAN DEPARTMENT OF TRANSPORTATION

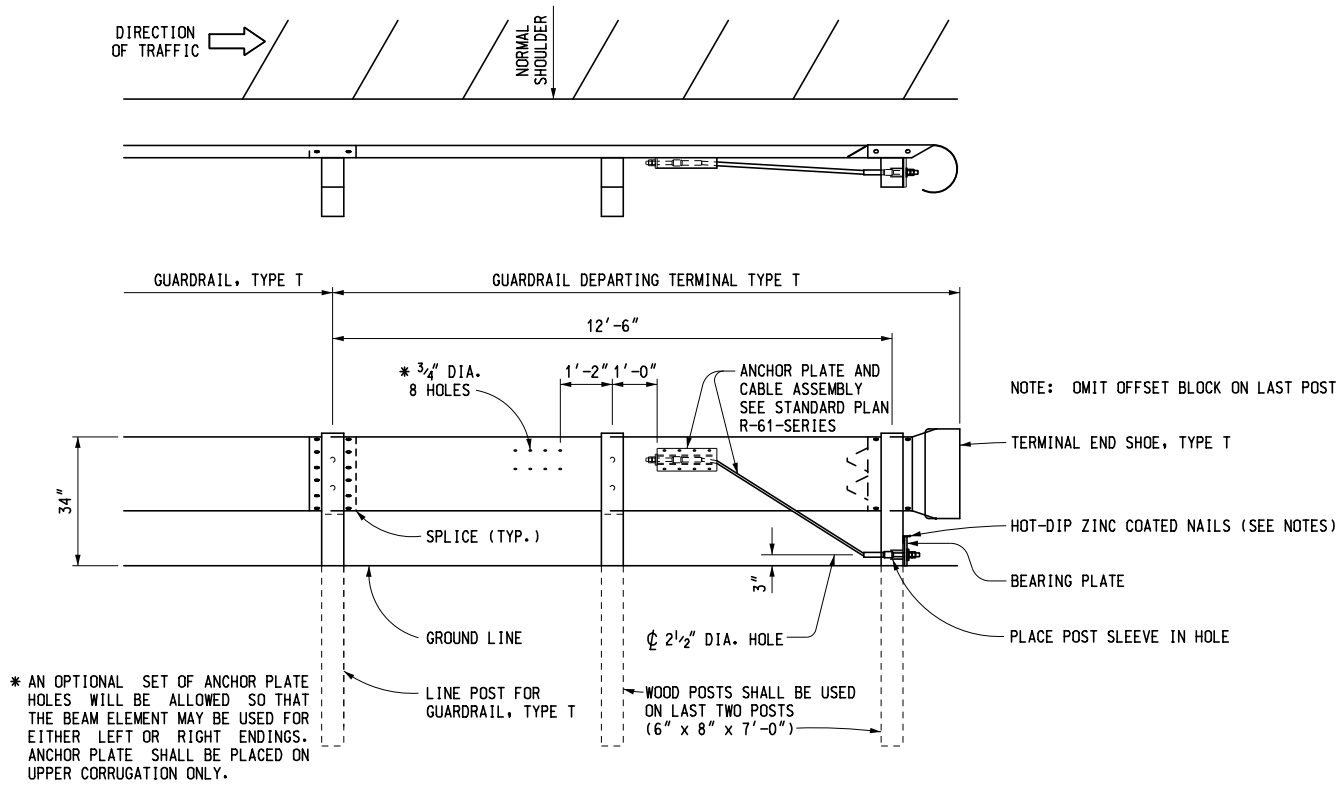
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & X-LITE-TANGENT-50)

F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	R-62-H	SHEET 10 OF 10



GUARDRAIL DEPARTING TERMINAL TYPE B



* AN OPTIONAL SET OF ANCHOR PLATE HOLES WILL BE ALLOWED SO THAT THE BEAM ELEMENT MAY BE USED FOR EITHER LEFT OR RIGHT ENDINGS. ANCHOR PLATE SHALL BE PLACED ON UPPER CORRUGATION ONLY.

GUARDRAIL DEPARTING TERMINAL TYPE T

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

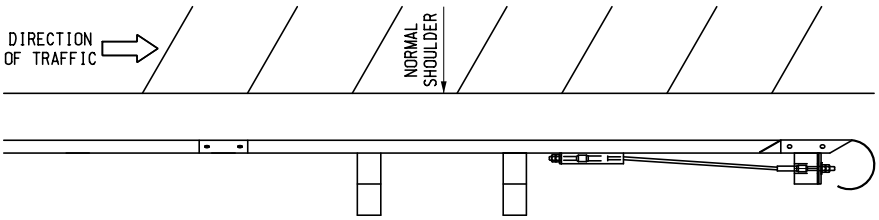
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

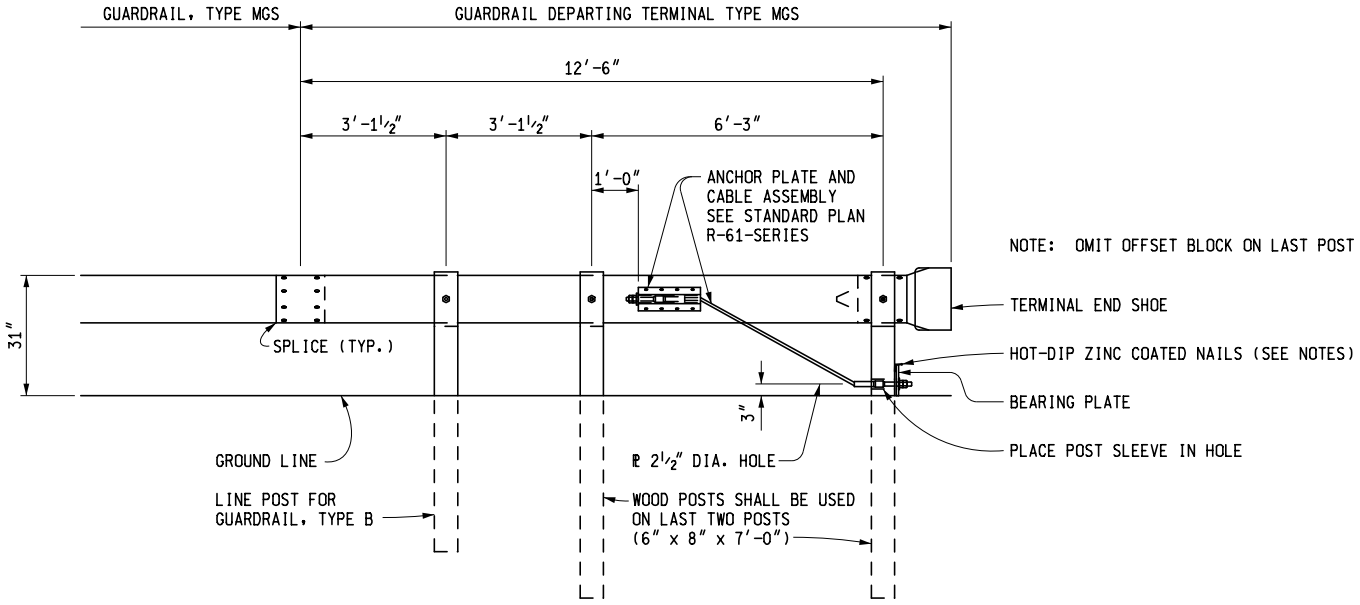
APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS

F.H.W.A. APPROVAL	1-28-2016 PLAN DATE	R-66-E	SHEET 1 OF 4



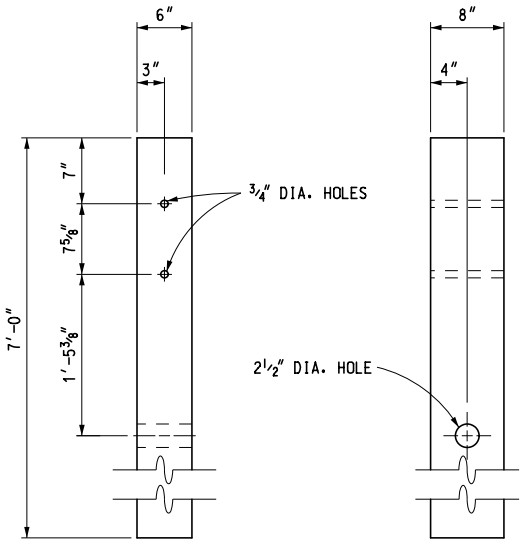


GUARDRAIL DEPARTING TERMINAL TYPE MGS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

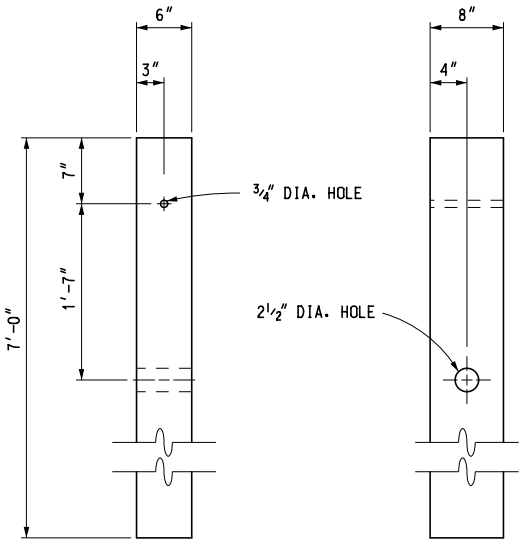
GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS

F.H.W.A. APPROVAL	1-28-2016 PLAN DATE	R-66-E	SHEET 2 OF 4



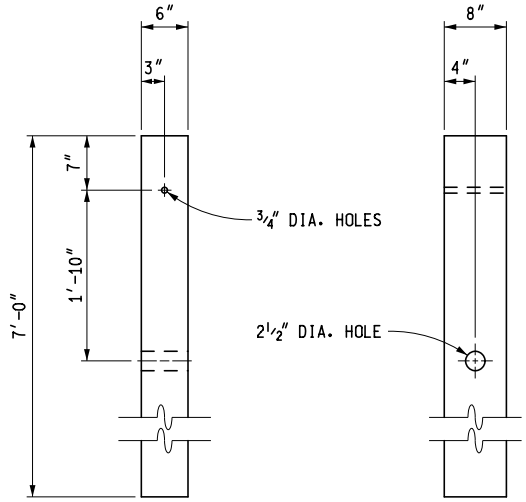
WOOD POST DETAIL

(FOR LAST POST, GUARDRAIL DEPARTING TERMINAL TYPE T)



WOOD POST DETAIL

(FOR LAST POST, GUARDRAIL DEPARTING TERMINAL TYPE B)



WOOD POST DETAIL

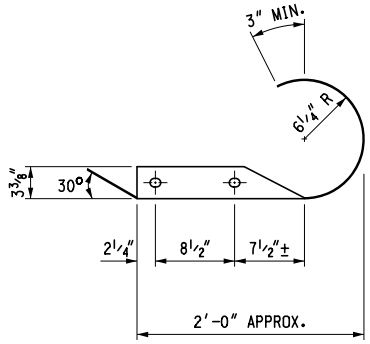
(FOR LAST POST, GUARDRAIL DEPARTING TERMINAL TYPE MGS)

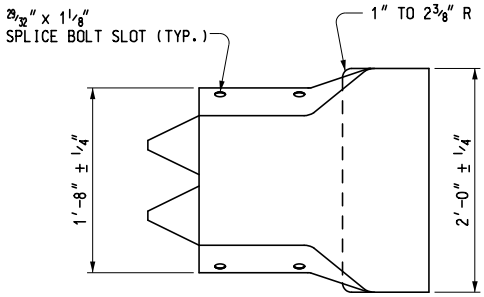
MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

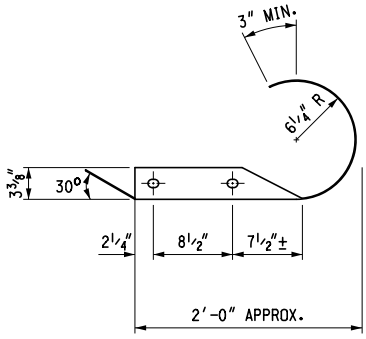
GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS

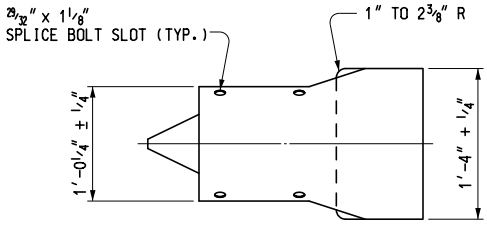
F.H.W.A. APPROVAL	1-28-2016 PLAN DATE	R-66-E	SHEET 3 OF 4



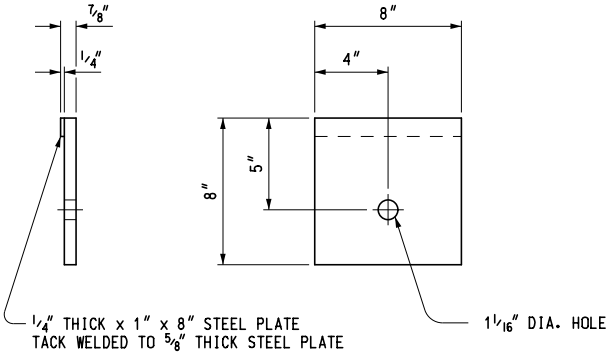


TERMINAL END SHOE, TYPE T

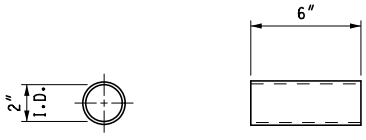




TERMINAL END SHOE,
TYPE B OR TYPE MGS



BEARING PLATE



POST SLEEVE

NOTES:

ALL POSTS, OFFSET BLOCKS, BEAM ELEMENTS, AND HARDWARE (INCLUDING BOLTS, NUTS, AND WASHERS) SHALL CONFORM TO THE CURRENT STANDARD SPECIFICATIONS AND TO THE CURRENT STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT AS SPECIFIED ON THIS STANDARD.

ALL 1:10 SLOPES SHALL BE GRADED TO CLASS A SLOPE TOLERANCES.

FOR DETAILS OF GUARDRAIL PLACEMENT, SEE STANDARD PLAN R-59-SERIES.

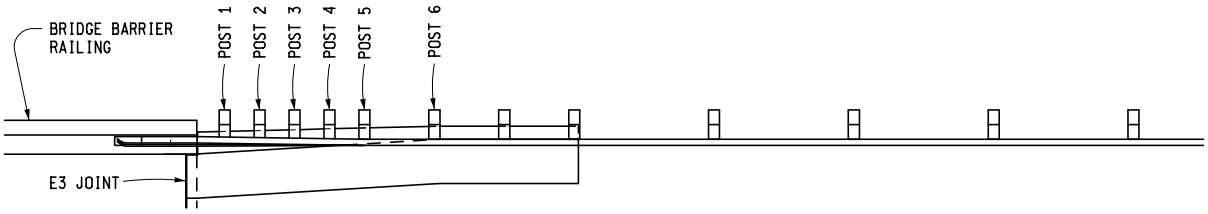
AFTER THE CABLE ASSEMBLY HAS BEEN TIGHTENED, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

TWO HOT-DIP ZINC COATED NAILS SHALL BE DRIVEN INTO THE WOOD POST AT THE TOP OF THE BEARING PLATE TO KEEP THE BEARING PLATE FROM ROTATING.

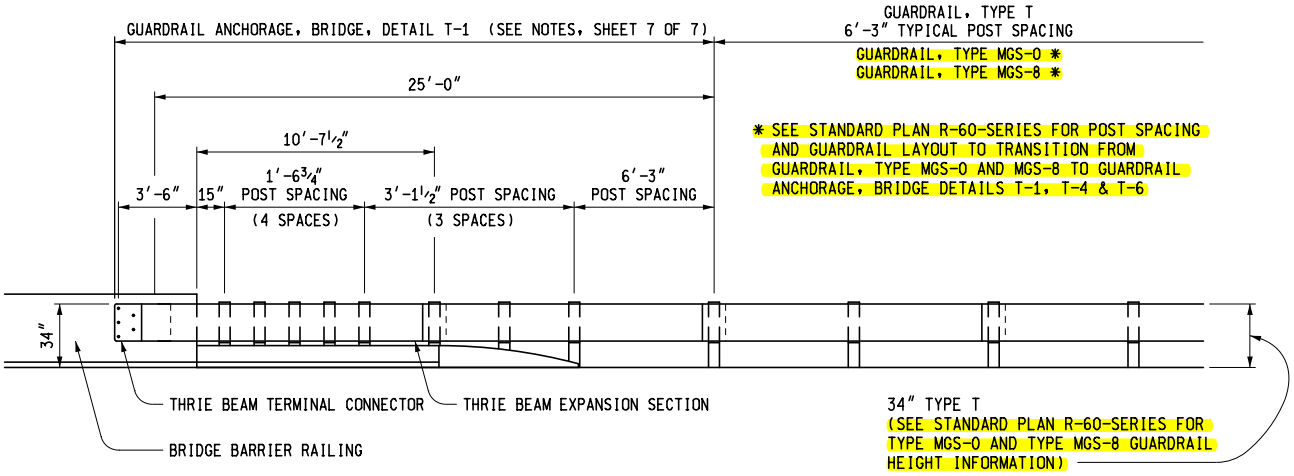
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS

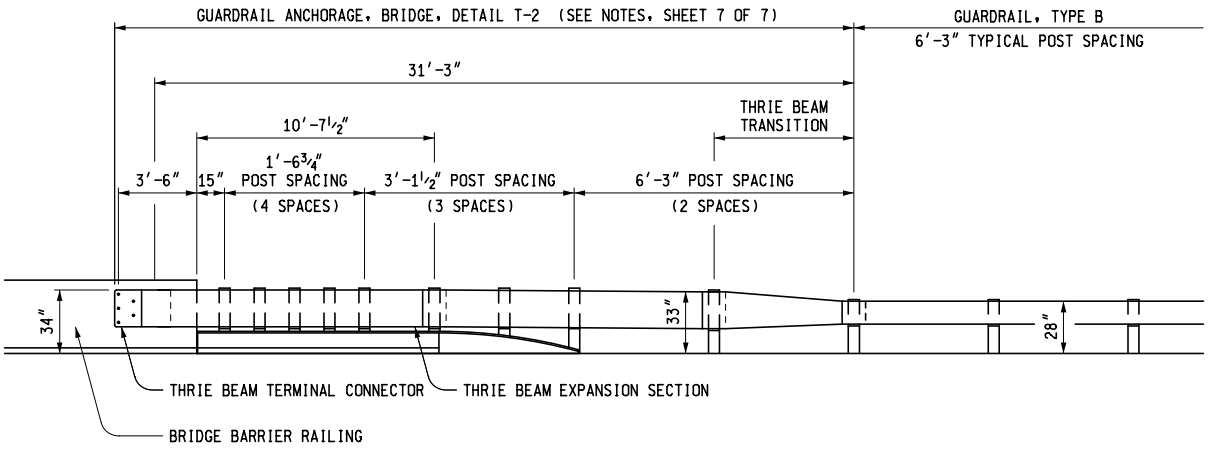
F.H.W.A. APPROVAL	1-28-2016 PLAN DATE	R-66-E	SHEET 4 OF 4



PLAN VIEW



ELEVATION VIEW
(TO BE USED WITH GUARDRAIL, TYPE T, TYPE MGS-O & TYPE MGS-8)



ELEVATION VIEW
(TO BE USED WITH GUARDRAIL, TYPE B)

DETAILS FOR CONNECTING GUARDRAIL TO BRIDGE BARRIER RAILINGS, TYPE 4, 2-TUBE, 4-TUBE, OR AESTHETIC PARAPET TUBE

(WITHOUT EXPANSION AT BACKWALL)

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: _____

CHECKED BY: _____

DEPARTMENT DIRECTOR
Kirk T. Steudle

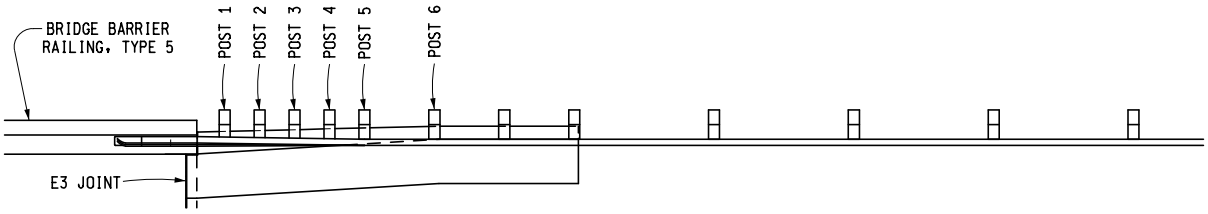
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

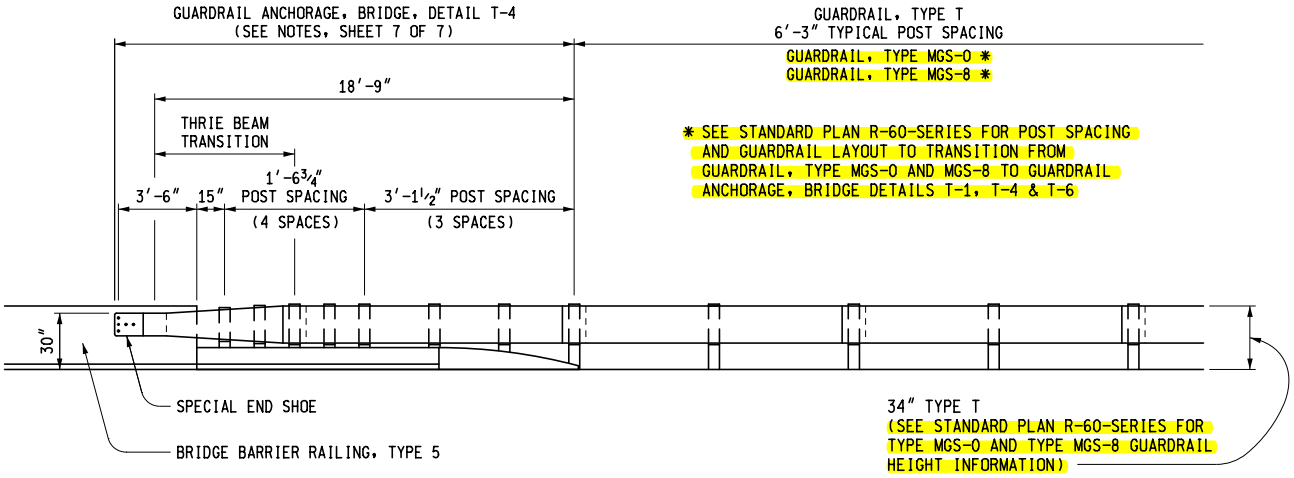
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

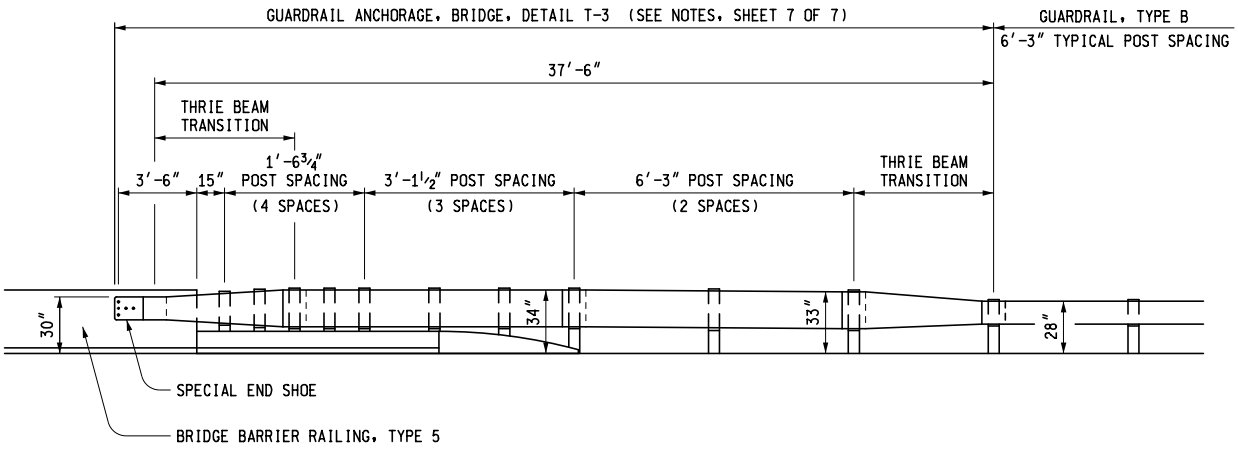
F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-67-G	SHEET 1 OF 7



PLAN VIEW



ELEVATION VIEW
(TO BE USED WITH GUARDRAIL, TYPE T, TYPE MGS-O & TYPE MGS-8)



ELEVATION VIEW
(TO BE USED WITH GUARDRAIL, TYPE B)

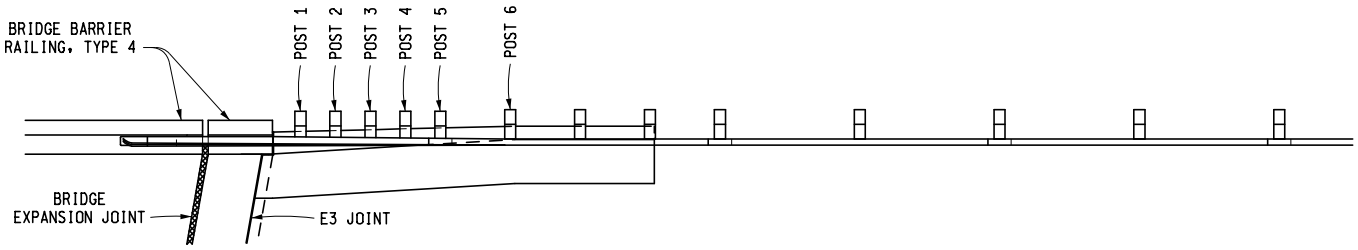
DETAILS FOR CONNECTING GUARDRAIL TO BRIDGE BARRIER RAILINGS, TYPE 5

(WITHOUT EXPANSION AT BACKWALL)

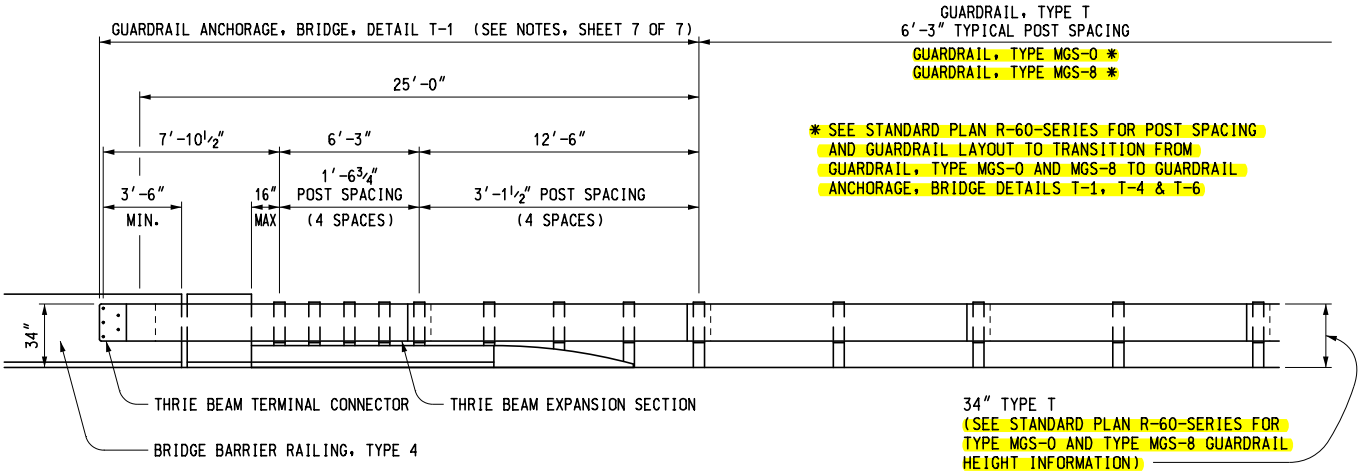
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

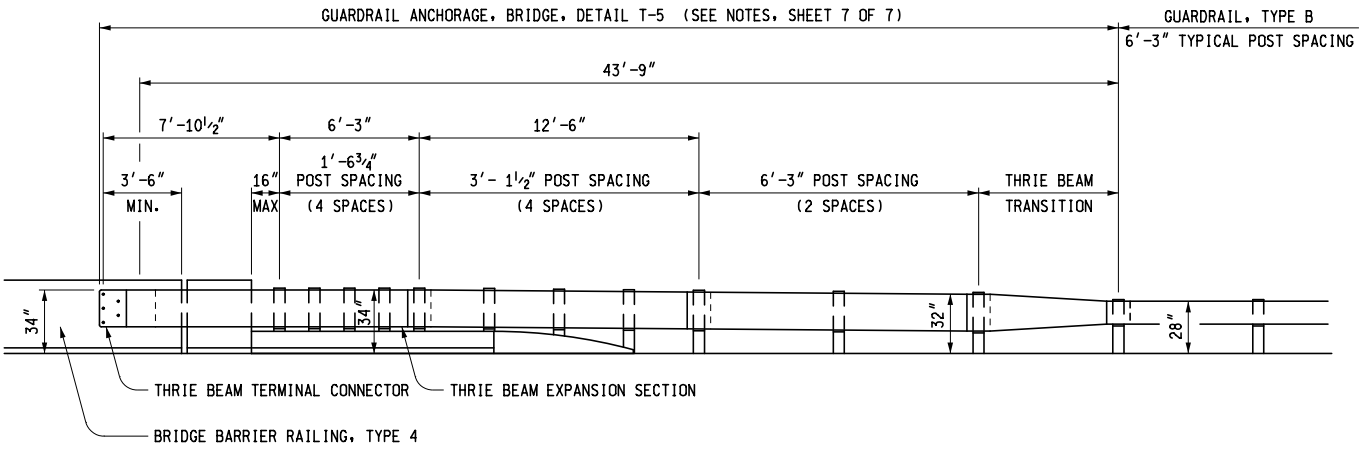
F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-67-G	SHEET 2 OF 7



PLAN VIEW



ELEVATION VIEW
(TO BE USED WITH GUARDRAIL, TYPE T, TYPE MGS-O & TYPE MGS-8)



ELEVATION VIEW
(TO BE USED WITH GUARDRAIL, TYPE B)

DETAILS FOR CONNECTING GUARDRAIL TO BRIDGE BARRIER RAILINGS, TYPE 4, 2-TUBE, 4-TUBE, OR AESTHETIC PARAPET TUBE

(WITH EXPANSION AT BACKWALL)

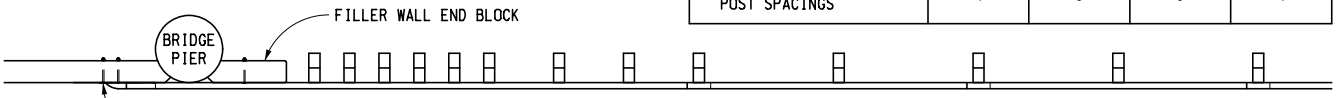
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-67-G	SHEET 3 OF 7

NOTE: FILLER WALL END BLOCK MAY BE OMITTED WHEN FIRST ANCHORAGE POST CAN BE INSTALLED FULL DEPTH 1′-3″ FROM BRIDGE PIER.

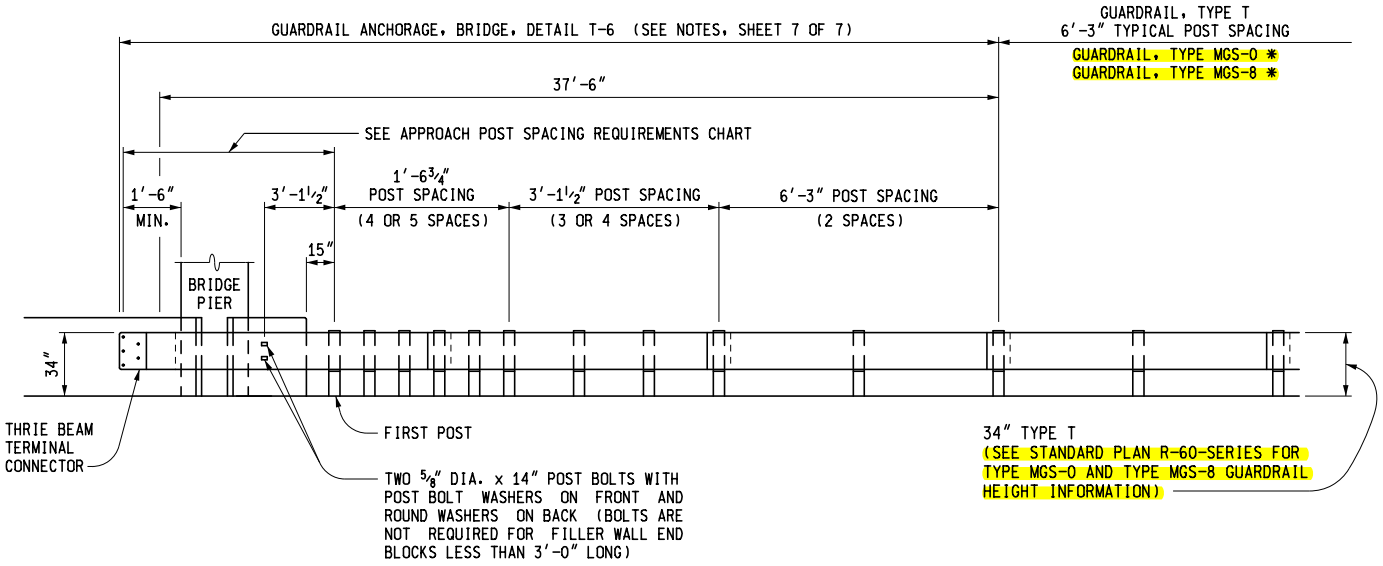
APPROACH POST SPACING REQUIREMENTS				
DISTANCE FROM ANCHOR BOLTS TO FIRST POST	7′-11¾″	9′-6½″	11′-1¼″	12′-8″
NUMBER OF 1′-6¾″ POST SPACINGS	4	5	4	5
NUMBER OF 3′-1½″ POST SPACINGS	4	3	3	4



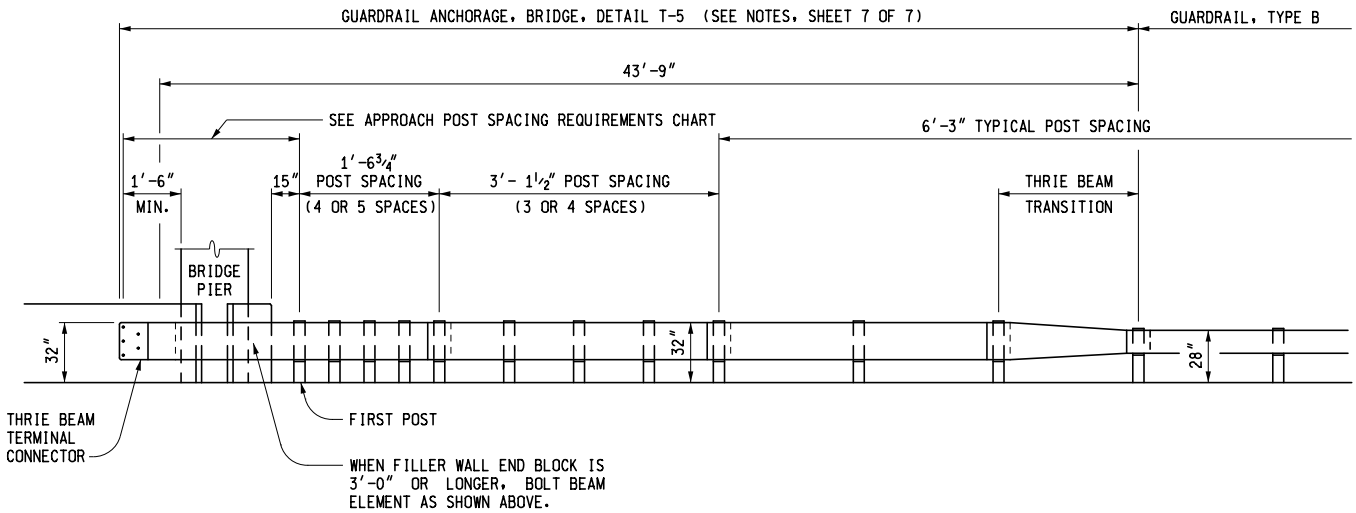
INSTALL BOLTS THROUGH FILLER WALL (SEE CHART FOR BOLT REQUIREMENTS FOR CONNECTING GUARDRAIL TO BRIDGE RAILINGS AND FILLER WALLS, SHEET 5 OF 7)

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-O AND MGS-8 TO GUARDRAIL ANCHORAGE, BRIDGE DETAILS T-1, T-4 & T-6

PLAN VIEW



ELEVATION VIEW
(TO BE USED WITH GUARDRAIL, TYPE T, TYPE MGS-O & TYPE MGS-8)



ELEVATION VIEW
(TO BE USED WITH GUARDRAIL, TYPE B)

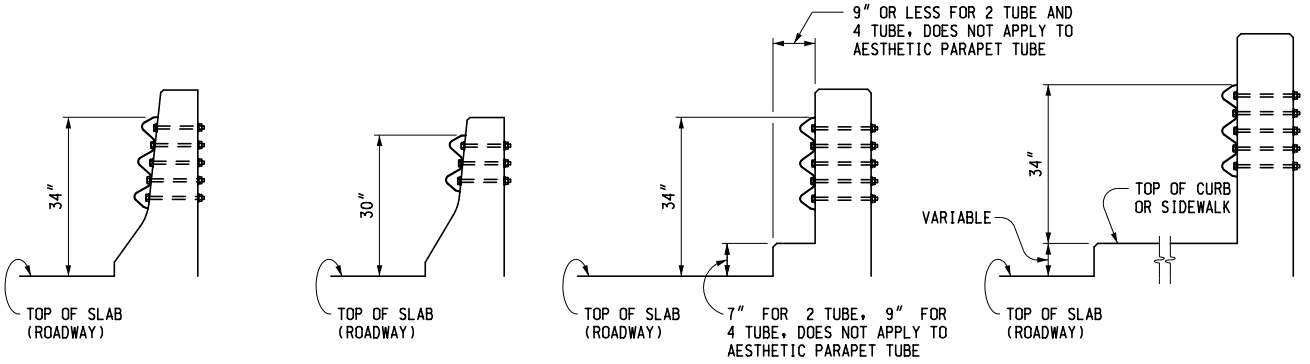
DETAILS FOR CONNECTING GUARDRAIL TO FILLER WALLS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-67-G	SHEET 4 OF 7

HIGH STRENGTH $\frac{7}{8}$" DIA. HEX HEAD BOLT AND NUTS SHALL BE USED TO CONNECT GUARDRAIL TO BRIDGE RAILINGS WITH ROUND WASHERS ON FRONT AND SQUARE WASHERS ON BACK. (SEE CHART BELOW FOR LENGTHS AND NUMBER REQUIRED.) WASHER DETAILS ARE SHOWN ON SHEET 6 OF 7.



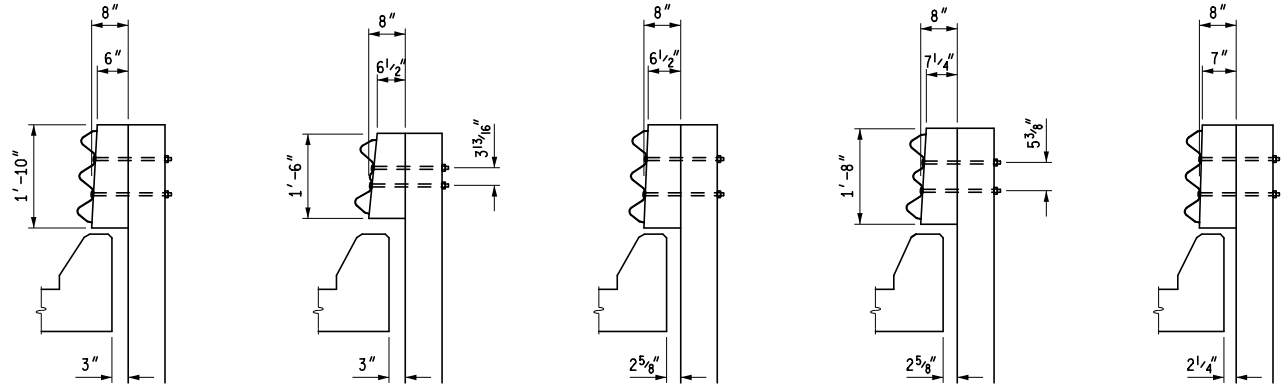
BRIDGE BARRIER RAILING TYPE 4

BRIDGE BARRIER RAILING TYPE 5

BRIDGE RAILING, 2 TUBE, 4 TUBE, OR AESTHETIC PARAPET TUBE
(WITHOUT SIDEWALK OR BRUSH BLOCK)

BRIDGE RAILING, 4 TUBE OR AESTHETIC PARAPET TUBE
(WITH SIDEWALK)

SECTIONS AT BRIDGE RAILINGS



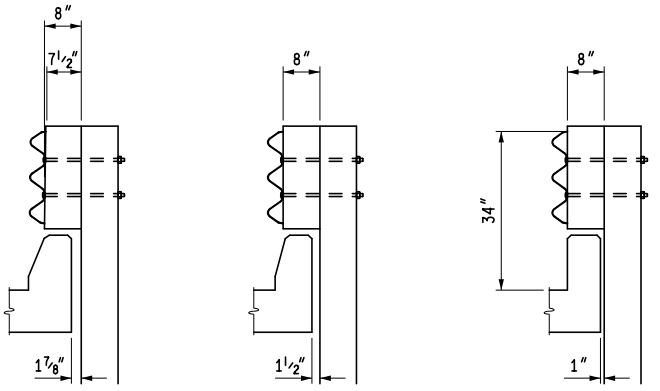
POST 1 FOR BRIDGE BARRIER RAILING, TYPE 4

POST 1 FOR BRIDGE BARRIER RAILING, TYPE 5

POST 2 FOR BRIDGE BARRIER RAILING, TYPE 4

POST 2 FOR BRIDGE BARRIER RAILING, TYPE 5

POST 3



POST 4

POST 5

POST 6

BOLT REQUIREMENTS FOR CONNECTING GUARDRAIL TO BRIDGE RAILINGS & FILLER WALLS			
BRIDGE RAILING	BOLT LENGTH	MINIMUM THREAD LENGTH	NUMBER REQUIRED
TYPE 4	12 1/2"	4"	5
TYPE 5	11 1/2"	4"	4
2 TUBE	WALL THICKNESS + 2"	2"	5
4 TUBE	WALL THICKNESS + 2"	2"	5
AESTHETIC PARAPET	WALL THICKNESS + 2"	2"	5
** FILLER WALL	WALL THICKNESS + 2"	2"	5
SHORTER BOLT LENGTHS MAY BE USED PROVIDED THE BOLT EXTENDS 1/4" BEYOND THE NUT WHEN TIGHTENED.			

** THE USE OF $\frac{7}{8}$" DIA. ADHESIVE ANCHORED BOLTS EMBEDDED 8" TO ATTACH GUARDRAIL TO FILLER WALLS WILL BE ALLOWED, INSTEAD OF BOLTING THROUGH THE FILLER WALL, IN THE FOLLOWING LOCATIONS:

1. AT OR NEAR THE JOINT LINE WHEN A FILLER WALL IS A DIFFERENT THICKNESS THAN THE FILLER WALL EXTENSION.
2. IN EXISTING FILLER WALLS THICKER THAN 1'-6".
3. WHEN CONDITIONS PROHIBIT THE USE OF BOLTS.

GUARDRAIL POST SECTIONS FOR GUARDRAIL ANCHORAGE, BRIDGE

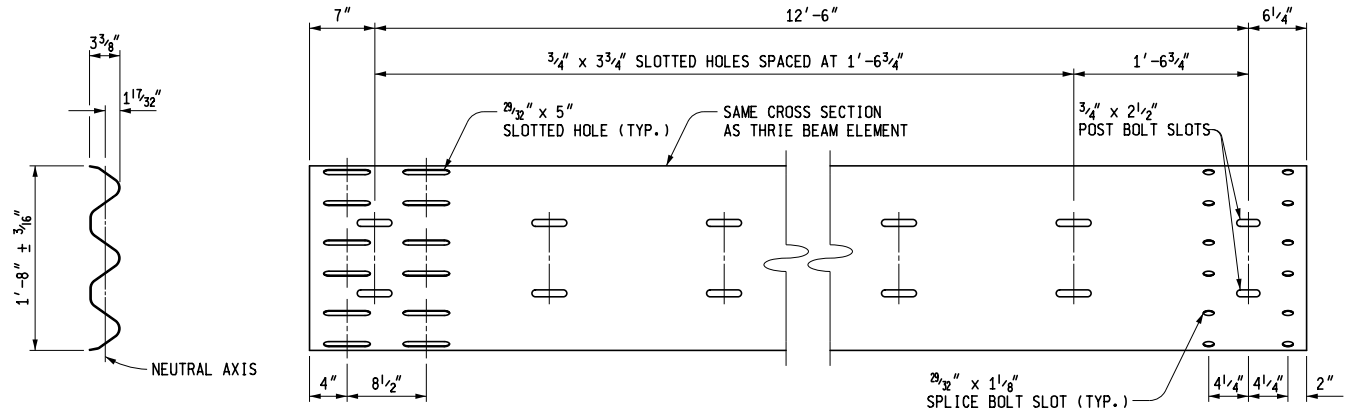
NOTE: ADHESIVE ANCHORS SHALL BE SELECTED FROM THE QUALIFIED PRODUCTS LIST OF THE MATERIALS SAMPLING GUIDE.

NOTE:
POST AND BLOCK SECTIONS FOR THE 2 TUBE, 4 TUBE, AND AESTHETIC PARAPET TUBE BRIDGE RAILINGS SHALL BE THE SAME AS THAT SHOWN ON POST 6. POST SPACING SHALL BE AS SHOWN IN ELEVATION VIEWS.

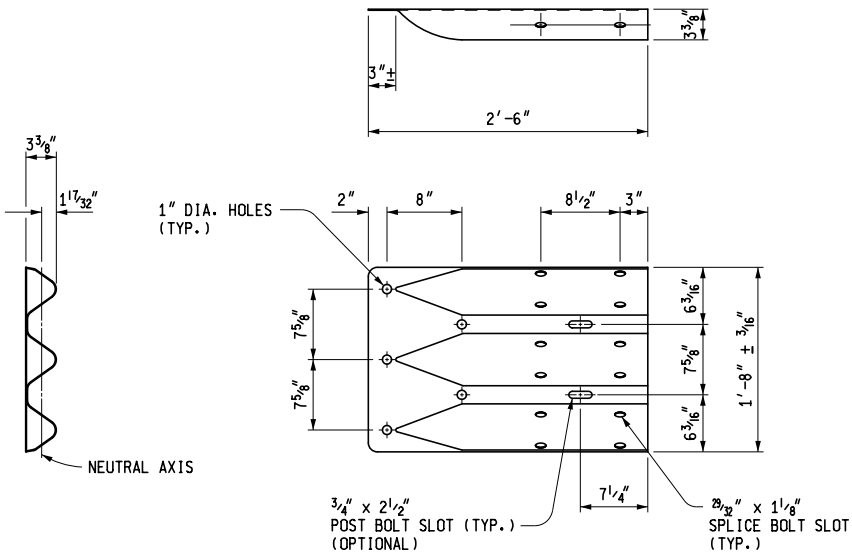
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

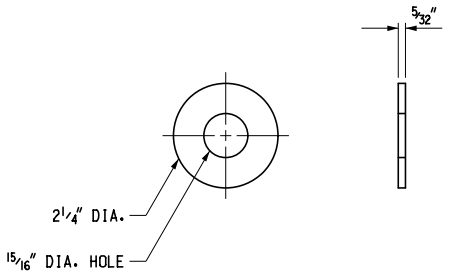
F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-67-G	SHEET 5 OF 7



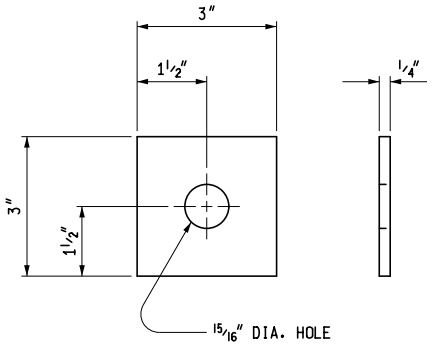
THRIE BEAM EXPANSION SECTION



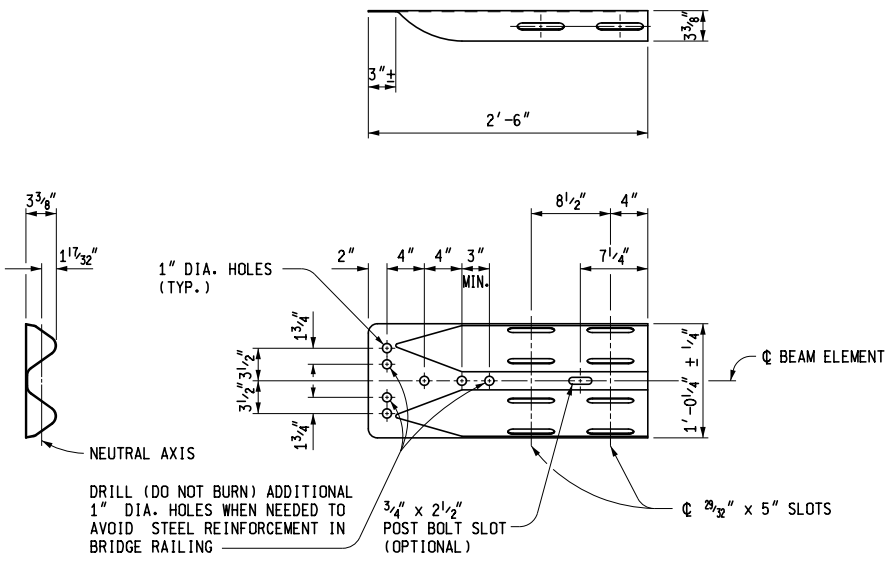
THRIE BEAM TERMINAL CONNECTOR



ROUND WASHER FOR 7/8" DIA. BOLTS



SQUARE WASHER FOR 7/8" DIA. BOLTS



SPECIAL END SHOE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-67-G	SHEET 6 OF 7

NOTES:

ALL POSTS, OFFSET BLOCKS, BEAM ELEMENTS, REFLECTORS, AND HARDWARE, (INCLUDING BOLTS, NUTS, AND WASHERS) SHALL CONFORM TO THE CURRENT STANDARD SPECIFICATIONS AND TO THE CURRENT STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT AS SPECIFIED ON THIS STANDARD.

ALL POSTS USED TO CONSTRUCT GUARDRAIL ANCHORAGE, BRIDGE SHALL BE 7'-0" LONG.

THE THRIE BEAM TERMINAL CONNECTOR AND SPECIAL END SHOE SHALL BE THE SAME MATERIAL AS ADJACENT RUN OF GUARDRAIL, EXCEPT THAT THEY SHALL NOT BE LIGHTER THAN 10 GAGE (0.138").

SECTIONS OF THE THRIE BEAM ELEMENT REQUIRED TO BE TWISTED FOR USE IN ANCHORAGE SHALL BE FIELD BENT.

GUARDRAIL BEAM ELEMENTS SHALL BE LAPPED IN THE DIRECTION OF TRAFFIC, EXCEPT FOR THE THRIE BEAM TERMINAL CONNECTOR WHICH MAY BE LAPPED IN EITHER DIRECTION.

STANDARD SPLICE BOLTS SHALL BE USED WHEN SPLICING THE THRIE BEAM TERMINAL CONNECTOR TO THE THRIE BEAM EXPANSION SECTION AND WHEN SPLICING THE SPECIAL END SHOE TO THE TRANSITION SECTION. THE SPLICE BOLT NUT SHALL BE INSTALLED FINGER-TIGHT AND SHALL FULLY ENGAGE THE SPLICE BOLT WITH A MINIMUM OF ONE THREAD EXTENDING BEYOND THE NUT. THIS SHALL BE FOLLOWED UP BY UPSETTING THE FIRST THREAD ON THE OUTSIDE OF THE NUT WITH A CENTER PUNCH OR COLD CHISEL, SO THAT IT WILL NOT LOOSEN.

SEE THE CURRENT STANDARD PLAN R-32-SERIES FOR APPROACH CURB AND GUTTER AND DOWNSPOUT HEADER.

GUARDRAIL ANCHORAGE, BRIDGE, DETAILS T-1, T-2, T-5, AND T-6 REQUIRE THAT THE THRIE BEAM TERMINAL CONNECTOR BE ATTACHED TO THE $\frac{29}{32}$" x 5" LONG SLOTTED HOLES IN THE THRIE BEAM EXPANSION SECTION.

SEE APPROPRIATE PLANS TO DETERMINE WHETHER GUARDRAIL ANCHORAGE, BRIDGE SPANS A BRIDGE EXPANSION JOINT.

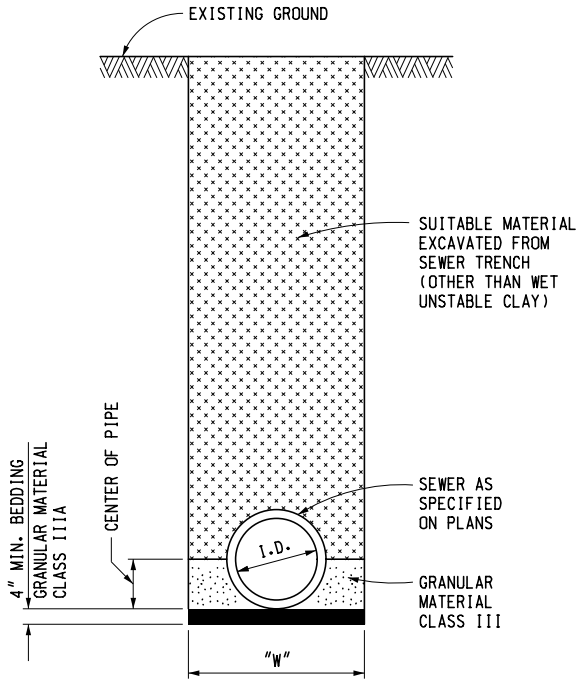
SEE THE CURRENT STANDARD PLAN R-55-SERIES FOR FILLER WALLS AND FILLER WALL END BLOCK.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

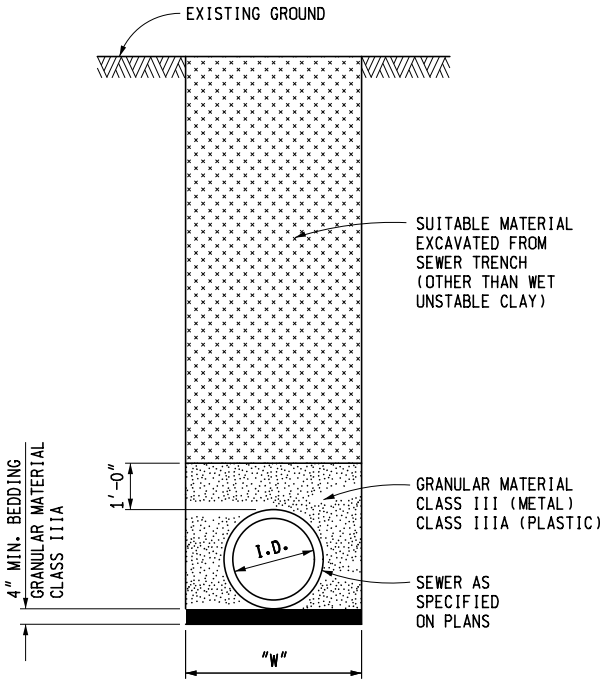
F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-67-G	SHEET 7 OF 7



SEWER NOT UNDER ROADBED
CONCRETE

NOTE: FOR "W" SEE NOTES ON SHEET 5

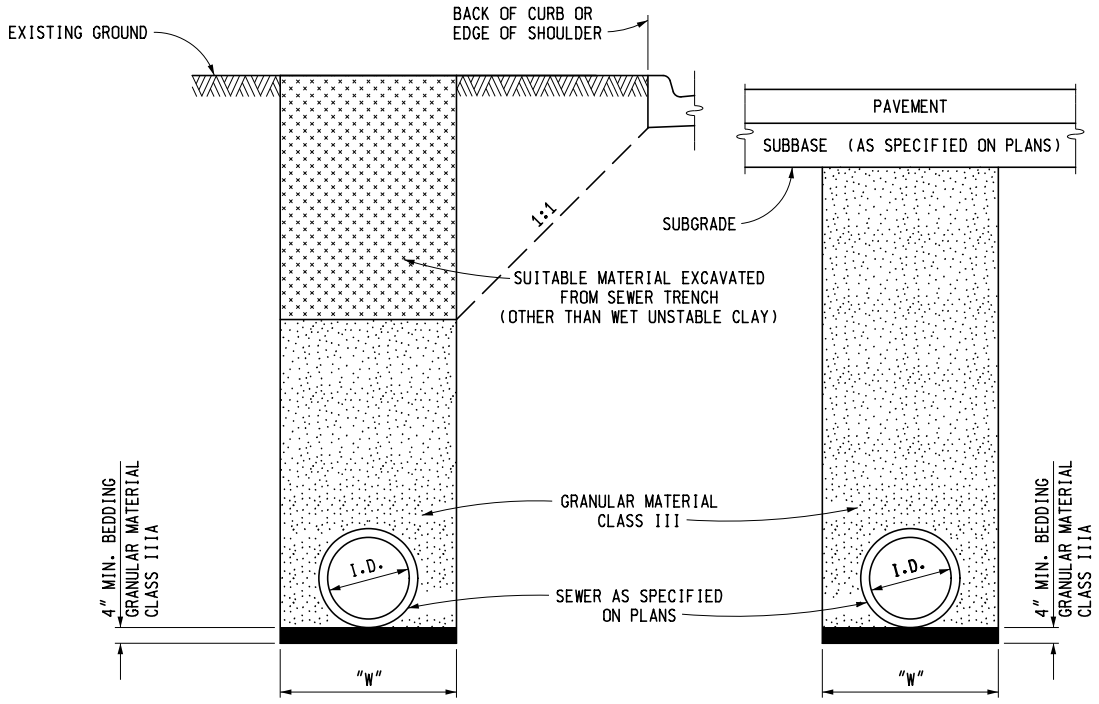
A1



SEWER NOT UNDER ROADBED
METAL & PLASTIC

NOTE: FOR "W" SEE NOTES ON SHEET 5

A2



SEWER UNDER ROADBED OR WITHIN INFLUENCE OF ROADBED
CONCRETE & METAL PIPE

B1

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

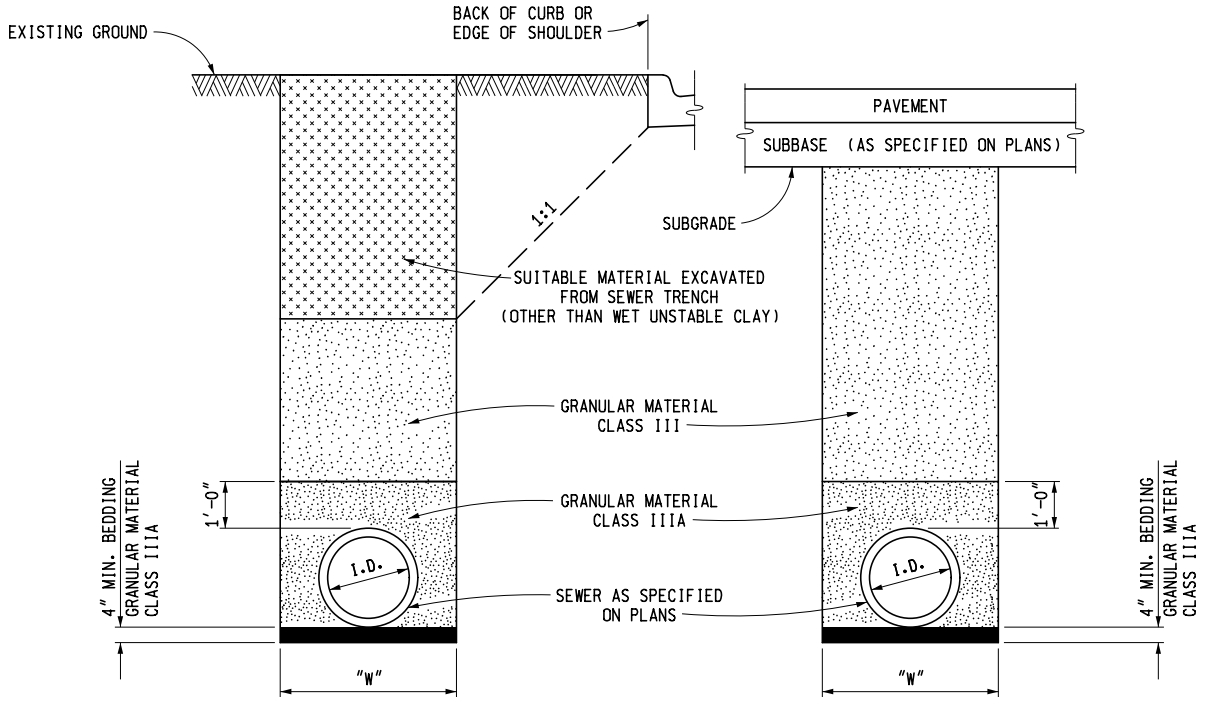
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

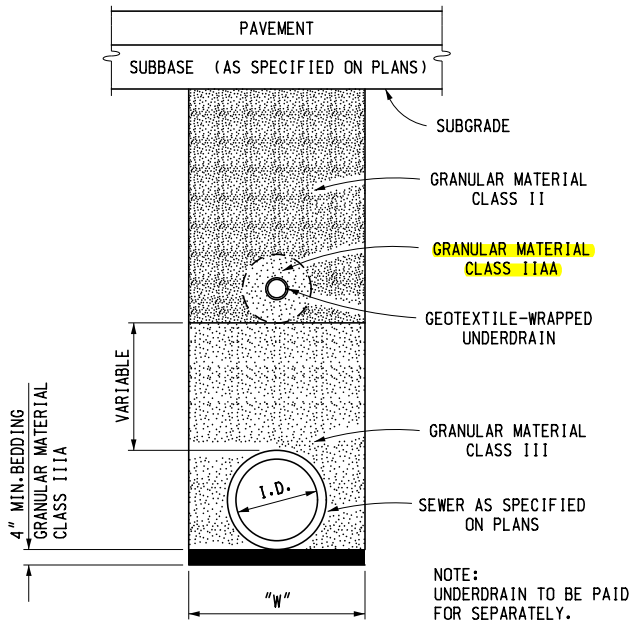
F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-83-C	SHEET 1 OF 5



SEWER UNDER ROADBED OR WITHIN INFLUENCE OF ROADBED

PLASTIC PIPE

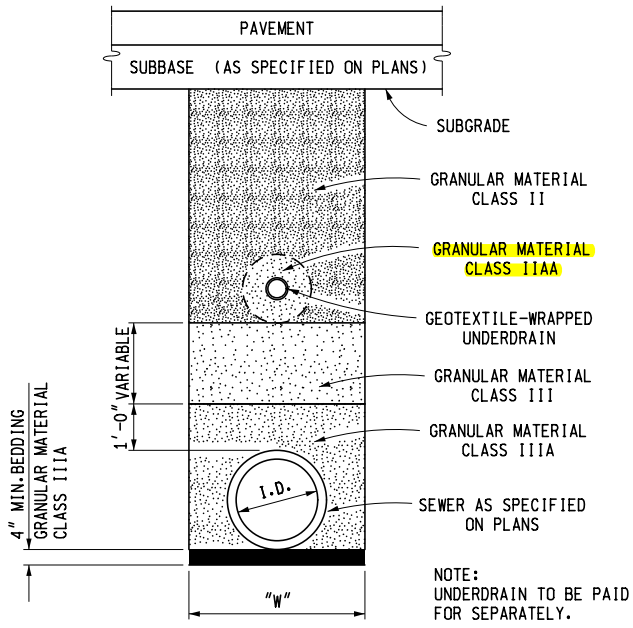
B2



SEWER WITH UNDERDRAIN UNDER ROADBED

CONCRETE & METAL PIPE

C1



SEWER WITH UNDERDRAIN UNDER ROADBED

PLASTIC PIPE

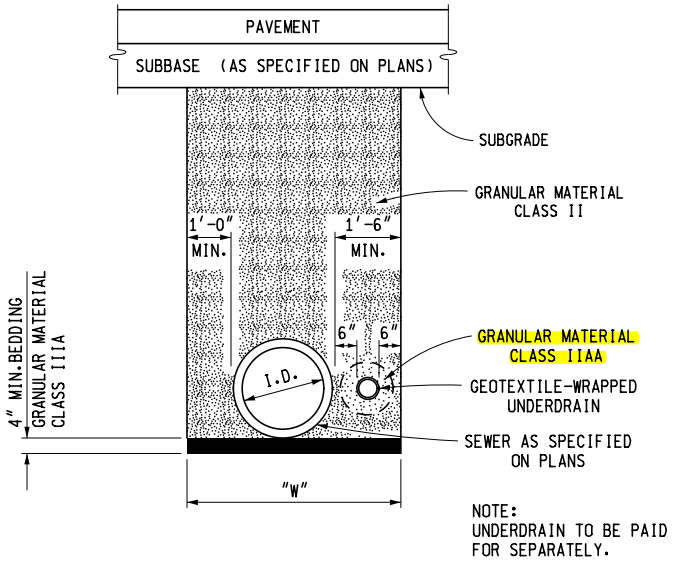
C2

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

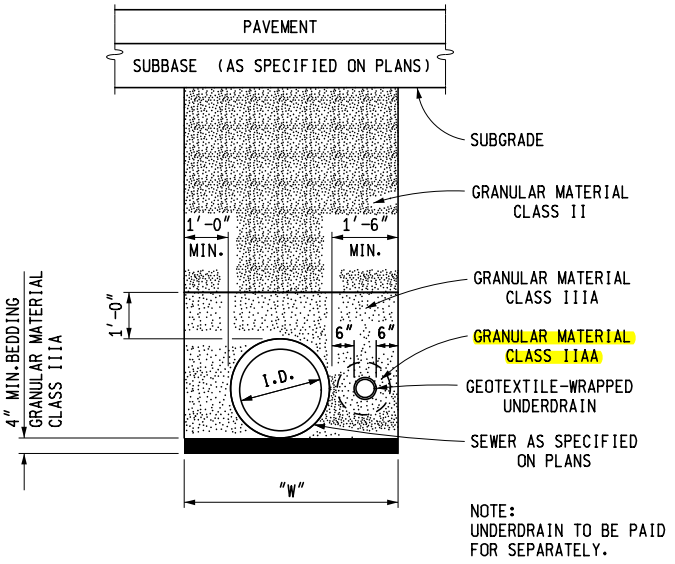
F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-83-C	SHEET 2 OF 5



SEWER WITH UNDERDRAIN UNDER ROADBED

CONCRETE & METAL PIPE
(FOR SHALLOW SEWERS)

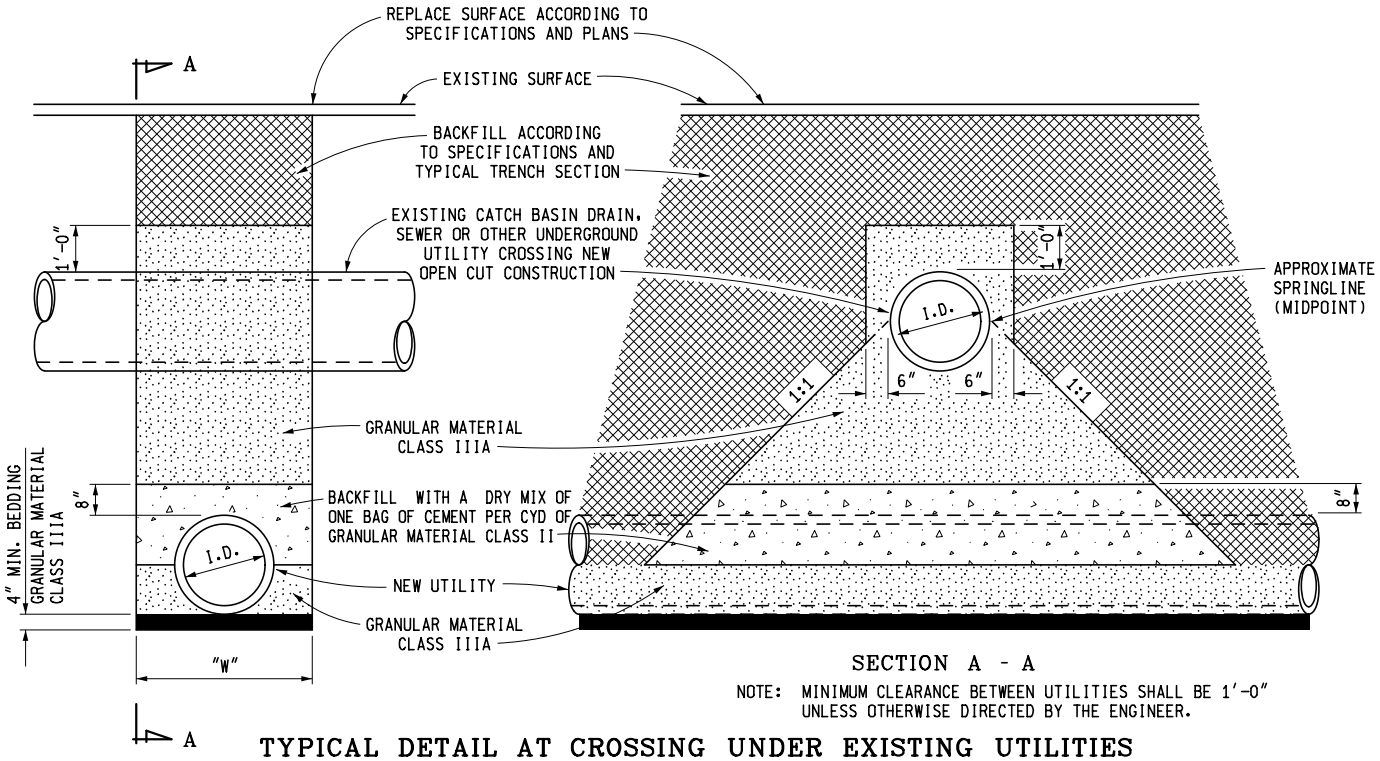
D1



SEWER WITH UNDERDRAIN UNDER ROADBED

PLASTIC PIPE
(FOR SHALLOW SEWERS)

D2



SECTION A - A

NOTE: MINIMUM CLEARANCE BETWEEN UTILITIES SHALL BE 1'-0" UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

TYPICAL DETAIL AT CROSSING UNDER EXISTING UTILITIES

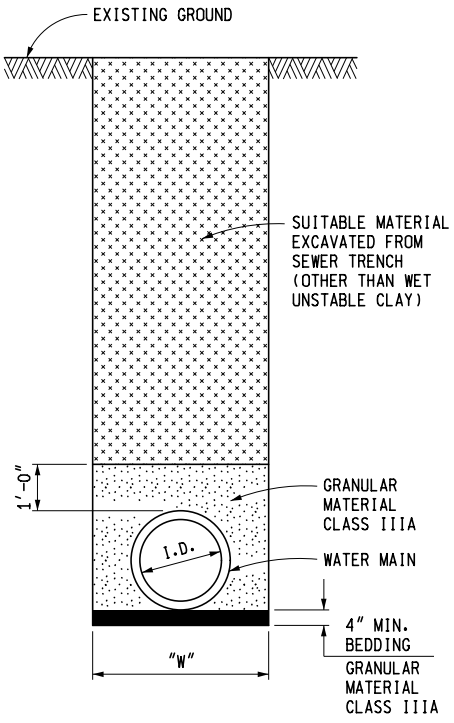
PAYMENT FOR THIS TRENCH DETAIL WILL BE INCLUDED WITH THE ADJACENT TRENCH DETAILS

E

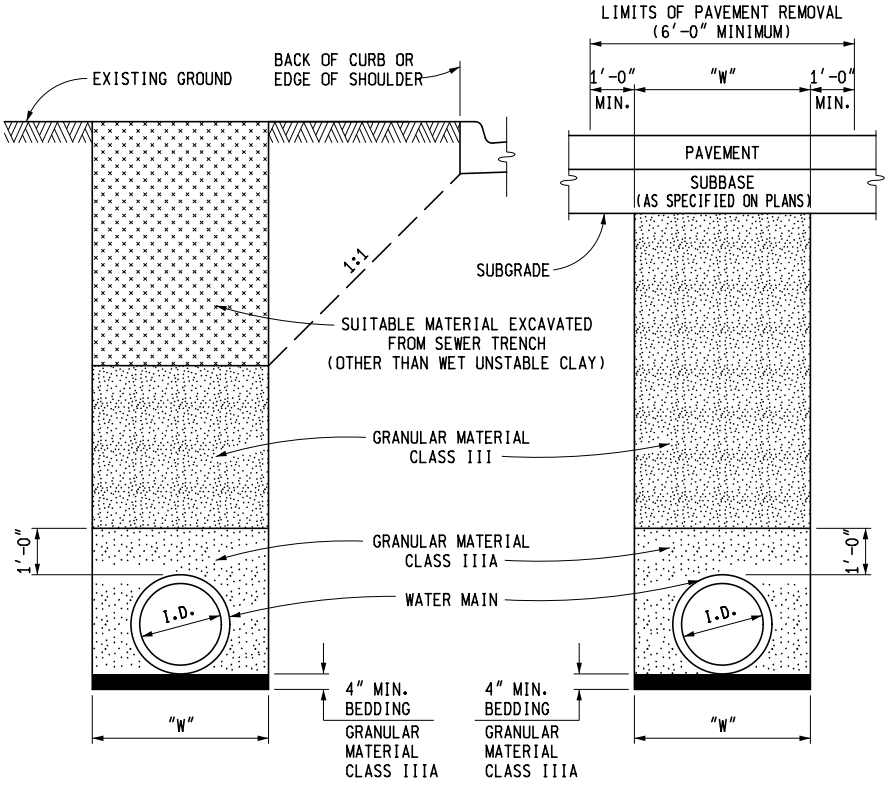
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-83-C	SHEET 3 OF 5

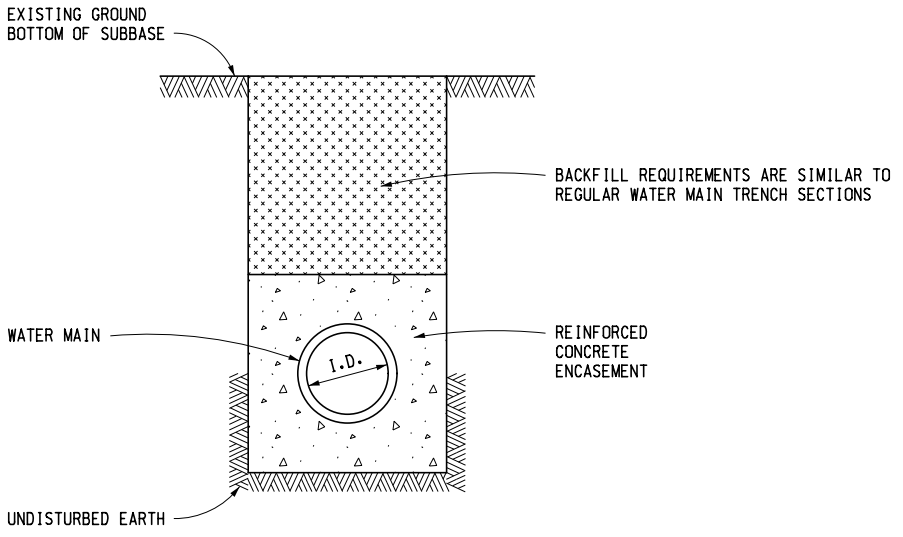


WATER MAINS NOT UNDER ROADBED F



NOTE: WHEN WATER MAIN IS PLACED IN PROPOSED ROADBED AREA, IT SHALL BE BACKFILLED WITH SELECTED EXCAVATION MATERIAL ABOVE FUTURE SUBGRADE TO EXISTING GROUND LINE.

WATER MAINS UNDER ROADBED OR WITHIN INFLUENCE OF ROADBED G



REQUIRED ENCASEMENT SIZE FOR RESPECTIVE PIPE SIZES	
DIAMETER OF PIPE	ENCASEMENT SIZE AND TRENCH WIDTH
6" - 12"	3'-0"
16"	3'-6"
24"	4'-6"
30"	5'-0"
36"	5'-6"
42"	6'-0"
48"	7'-0"
54"	7'-6"
60"	8'-0"
66"	8'-6"
72"	9'-0"

NOTE:
REINFORCEMENT SHALL BE AS SPECIFIED ON PLANS.

WATER MAINS IN REINFORCED CONCRETE ENCASEMENT H

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-83-C	SHEET 4 OF 5

NOTES:

BACKFILLING SHALL BE ACCORDING TO THE STANDARD SPECIFICATION.

SUFFICIENT TRENCH WIDTH SHALL BE PROVIDED TO ALLOW FREE WORKING SPACE AND TO PERMIT COMPACTING THE BACKFILL AROUND THE PIPE.

THE FOLLOWING ARE MINIMUM TRENCH WIDTHS:

I.D. PIPE SIZE (INCHES)	LESS THAN 18	21	24	30	36
"W" TRENCH WIDTH (FEET)	3.0	3.5	4.0	5.0	6.0

I.D. PIPE SIZE (INCHES)	42	48	54	60	66	72
"W" TRENCH WIDTH (FEET)	7.0	8.0	9.5	10.0	10.5	11.0

I.D. PIPE SIZE (INCHES)	78	84	90	96	102	108
"W" TRENCH WIDTH (FEET)	11.5	12.0	12.5	13.0	13.5	14.0

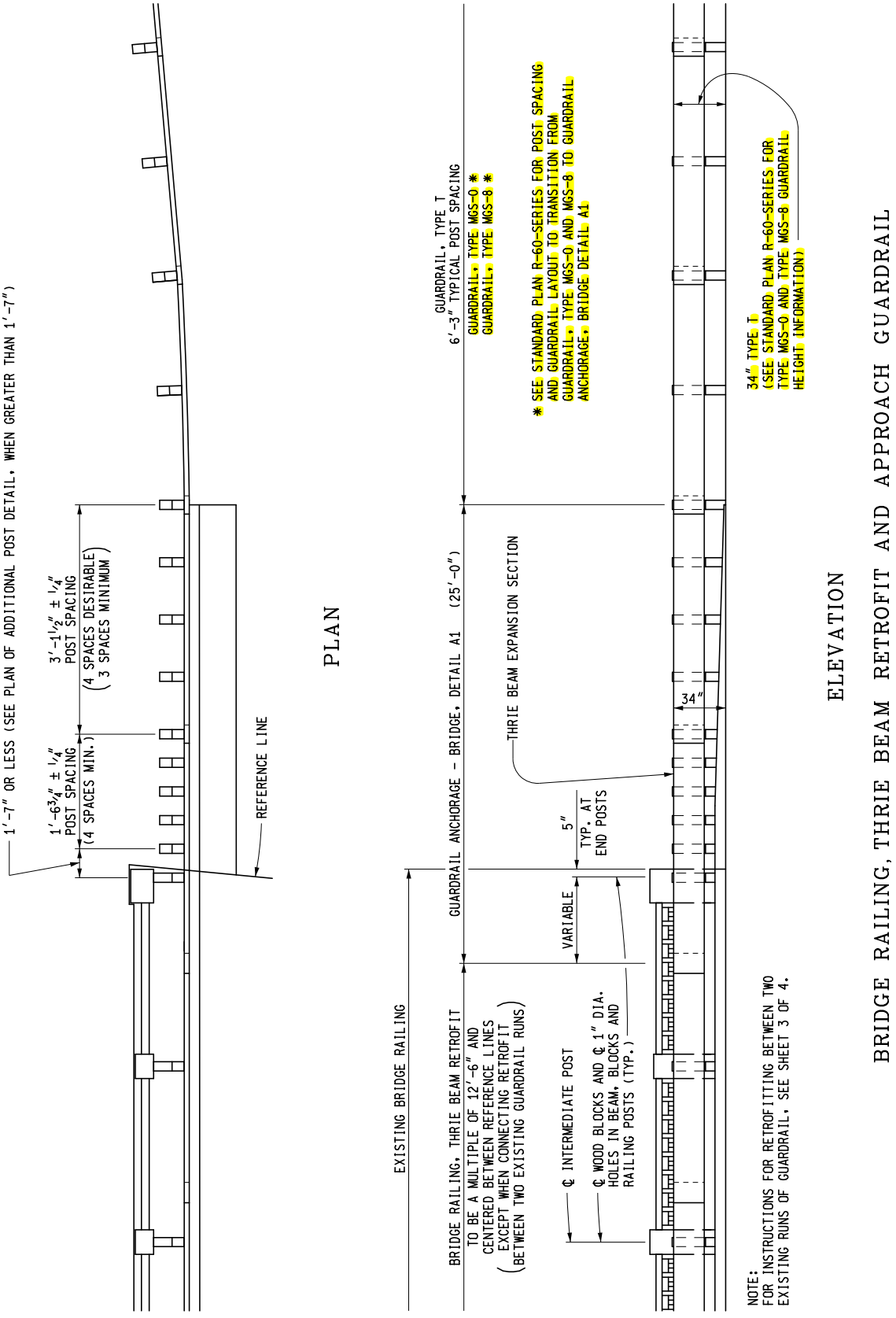
ESTIMATED PAVEMENT REMOVAL WIDTH IS TO BE TRENCH WIDTH "W" PLUS 1'-0" EACH SIDE OF THE TRENCH (6'-0" MINIMUM).

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	R-83-C	SHEET 5 OF 5



MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: _____

CHECKED BY: _____

DEPARTMENT DIRECTOR
Kirk T. Steudle

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

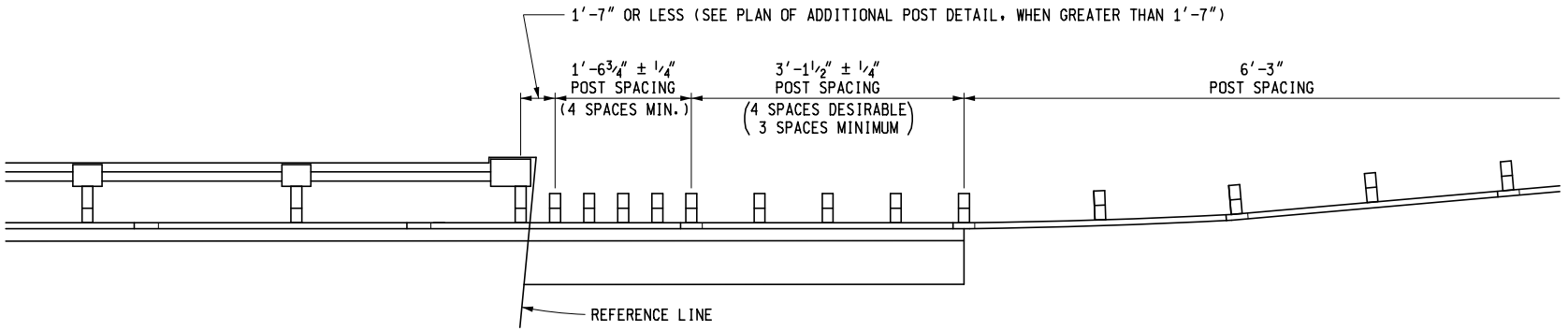
APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

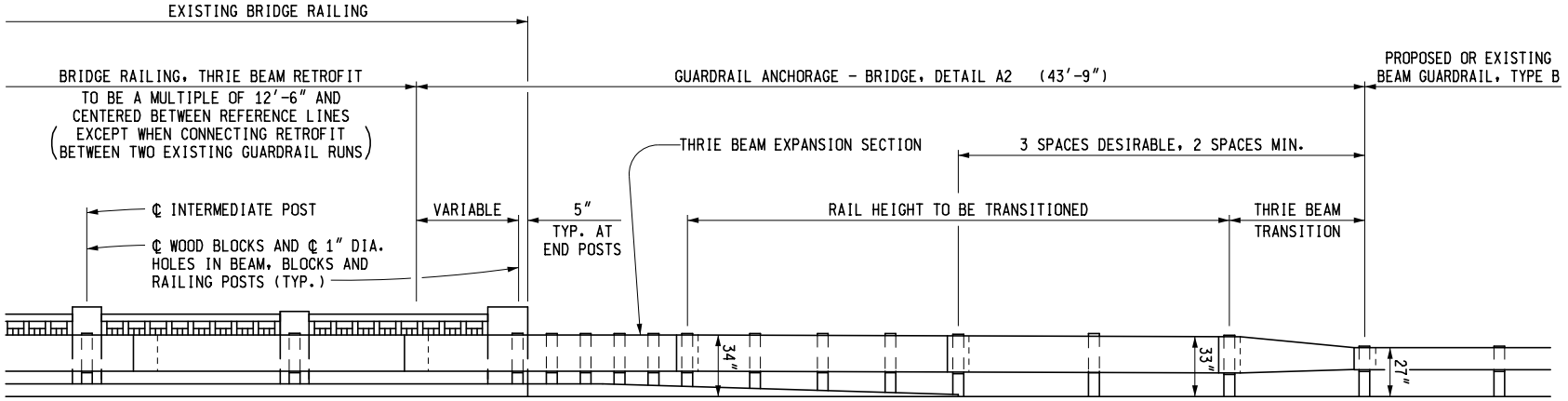
BRIDGE RAILING, THRIE BEAM RETROFIT

(R4 TYPE BRIDGE RAILING)

F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	B-22-E	SHEET 1 OF 4



PLAN



NOTE:
FOR INSTRUCTIONS FOR RETROFITTING BETWEEN TWO EXISTING RUNS OF GUARDRAIL, SEE SHEET 3 OF 4.

ELEVATION

BRIDGE RAILING, THRIE BEAM RETROFIT AND APPROACH GUARDRAIL

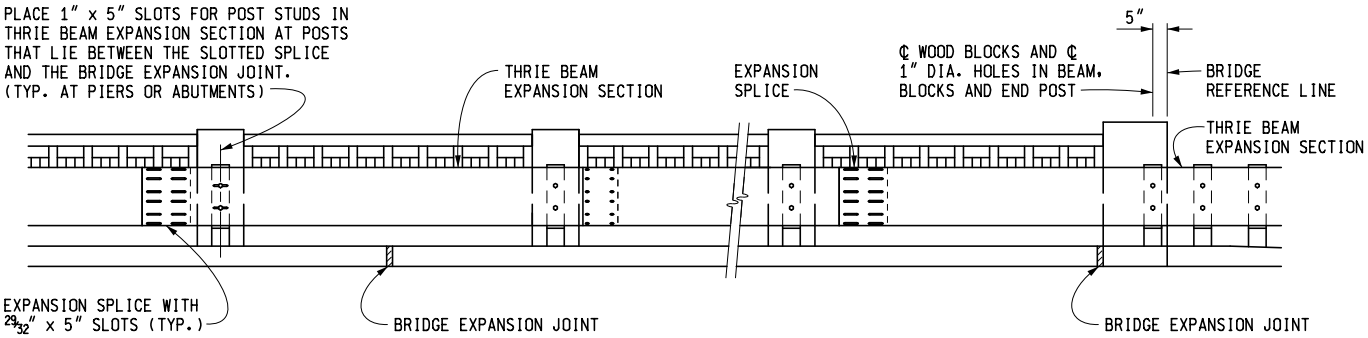
(FOR USE WITH BEAM GUARDRAIL, TYPE B)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

BRIDGE RAILING, THRIE BEAM RETROFIT

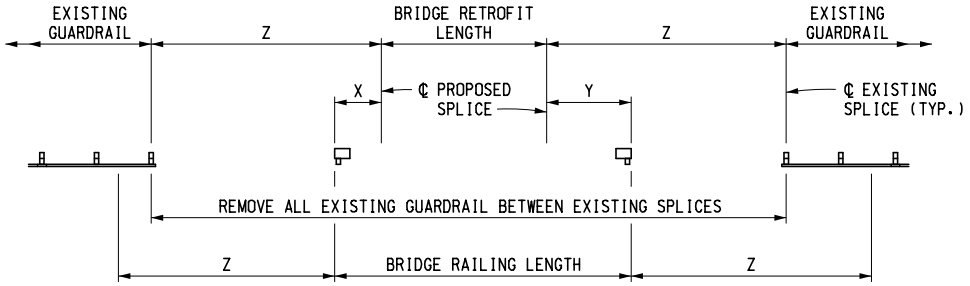
(R4 TYPE BRIDGE RAILING)

F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	B-22-E	SHEET 2 OF 4



AT PIER AT ABUTMENT

ELEVATION SHOWING THRIE BEAM RETROFIT OVER BRIDGE EXPANSION JOINTS

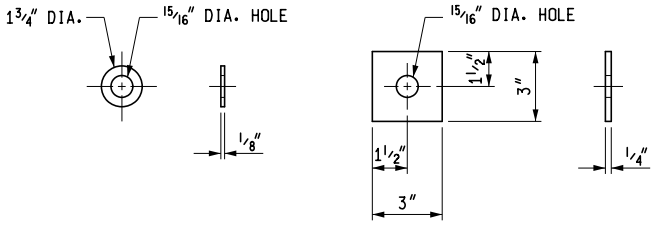


Z = 25'-0" WHEN CONNECTING TO BEAM GUARDRAIL, TYPE T, TYPE MGS-0, OR TYPE MGS-8. USE GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A1
OR
Z = 43'-9" WHEN CONNECTING TO BEAM GUARDRAIL, TYPE B. USE GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A2.

SKETCH FOR RETROFITTING BETWEEN TWO EXISTING RUNS OF GUARDRAIL

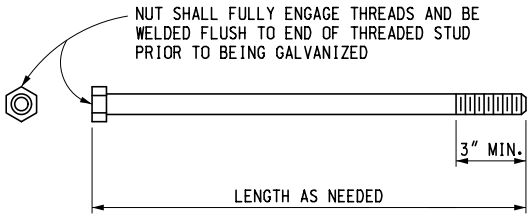
INSTRUCTIONS FOR LAYING OUT RETROFIT
BETWEEN TWO EXISTING RUNS OF GUARDRAIL

1. MEASURE THE APPROPRIATE "Z" DISTANCE FROM ONE END OF THE BRIDGE RAILING AND LOCATE THE FIRST EXISTING SPLICE BACK TOWARD THE BRIDGE.
2. FROM THIS SPLICE, MEASURE THE SAME "Z" DISTANCE BACK TOWARD THE BRIDGE TO OBTAIN THE "X" DIMENSION. THIS DIMENSION WILL VARY FROM 0 TO 12'-6".
3. REPEAT STEPS 1 AND 2, FROM OPPOSITE END OF THE BRIDGE TO OBTAIN "Y" DIMENSION.
4. SUBTRACT THE SUM OF "X" + "Y" FROM BRIDGE RAILING LENGTH. THIS WILL BE THE BRIDGE RETROFIT LENGTH.
5. DIVIDE THE BRIDGE RETROFIT LENGTH BY 12'-6" TO OBTAIN THE NUMBER OF BEAM ELEMENTS PLUS A REMAINDER. THE REMAINDER WILL BE THE LENGTH OF A SHORTENED ELEMENT.
6. WHEN THE REMAINDER IS LESS THAN 2'-6", ADD 12'-6" TO THE REMAINDER AND DIVIDE BY TWO. THE BRIDGE RETROFIT WILL CONTAIN TWO SHORTENED BEAM ELEMENTS WITH ONE LESS 12'-6" BEAM ELEMENT THAN CALCULATED IN STEP 5.



ROUND WASHER SQUARE WASHER

WASHERS USED WITH 7/8" DIA. STUDS



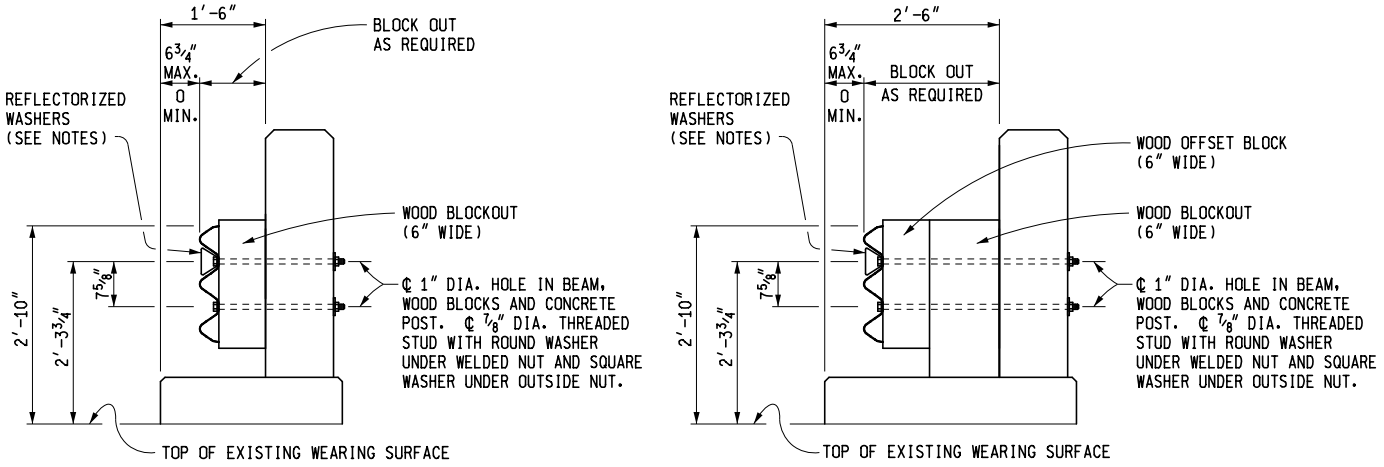
7/8" DIA. THREADED STUD

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

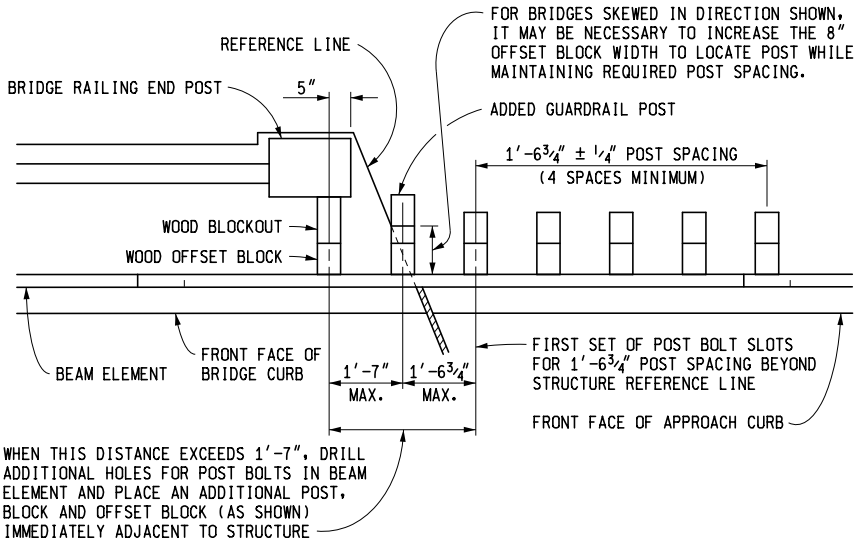
BRIDGE RAILING, THRIE BEAM RETROFIT

(R4 TYPE BRIDGE RAILING)

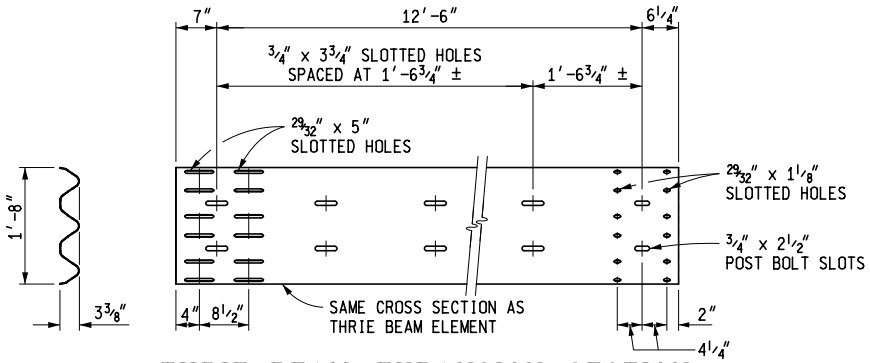
F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	B-22-E	SHEET 3 OF 4



SECTIONS THRU R4 RAILING

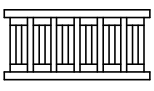


PLAN OF ADDITIONAL POST DETAIL



THRIE BEAM EXPANSION SECTION

NOTE:



R4 TYPE BRIDGE RAILINGS CAN BE IDENTIFIED AS HAVING CONCRETE POSTS AND REMOVABLE METAL PANELS WITH GRIDS OF THIS PATTERN.

NOTES:

THIS STANDARD IS INTENDED FOR USE IN UPGRADING OF EXISTING R4 TYPE BRIDGE RAILINGS AND APPROACH GUARDRAIL.

BRIDGE RAILING, THRIE BEAM RETROFIT AND GUARDRAIL ANCHORAGES SHALL CONFORM TO THE CURRENT STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT AS SHOWN ON THIS PLAN.

ALL WORK AND MATERIAL SHALL BE IN ACCORDANCE WITH SECTIONS 807 & 908 OF THE STANDARD SPECIFICATIONS.

REFLECTORIZED WASHERS SHALL BE SPACED AT 25′-0″ INTERVALS AT BEAM ELEMENT SPLICES. THEY SHALL BE ATTACHED AT UPPER POST BOLT SLOTS WITH STANDARD SPLICE BOLTS.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

BRIDGE RAILING, THRIE BEAM RETROFIT

(R4 TYPE BRIDGE RAILING)

F.H.W.A. APPROVAL	2-4-2016 PLAN DATE	B-22-E	SHEET 4 OF 4

MDOT
Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: ____

CHECKED BY: ____

APPROVED BY: ____ DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: ____ DIRECTOR, BUREAU OF DEVELOPMENT

DEPARTMENT DIRECTOR
Kirk T. Steudle

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

BRIDGE RAILING, THRIE BEAM RETROFIT

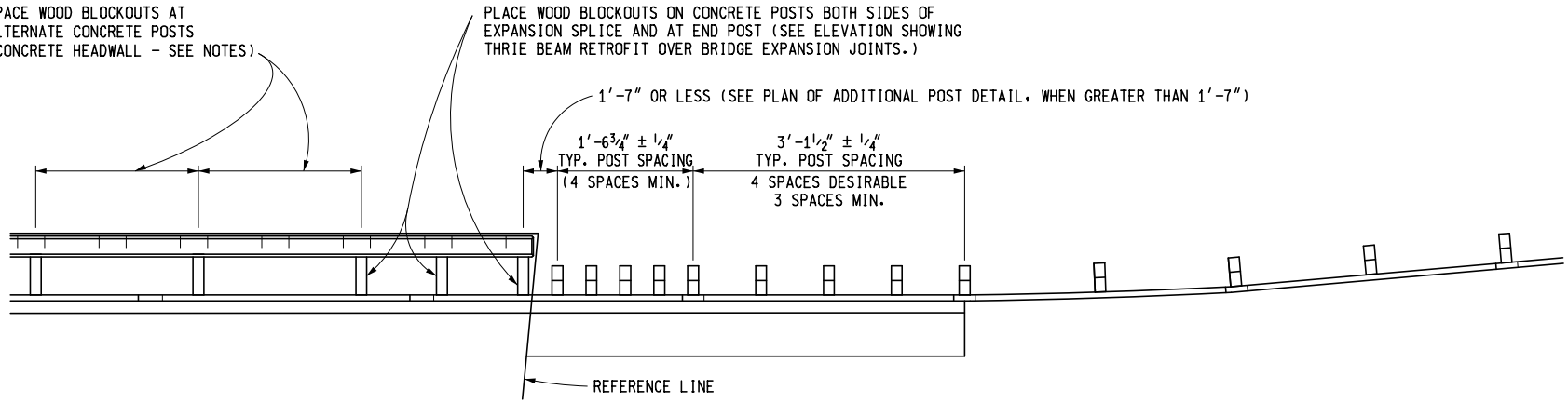
(OPEN PARAPET TYPE BRIDGE RAILING)

F.H.W.A. APPROVAL

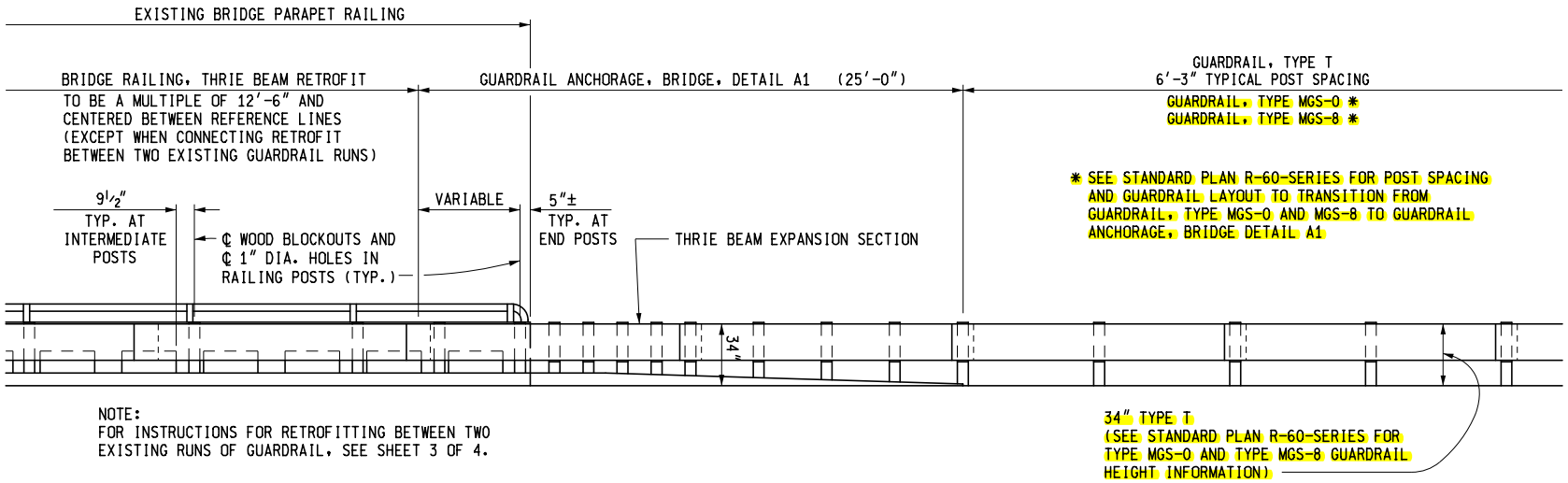
2-5-2016
PLAN DATE

B-23-F

SHEET 1 OF 4



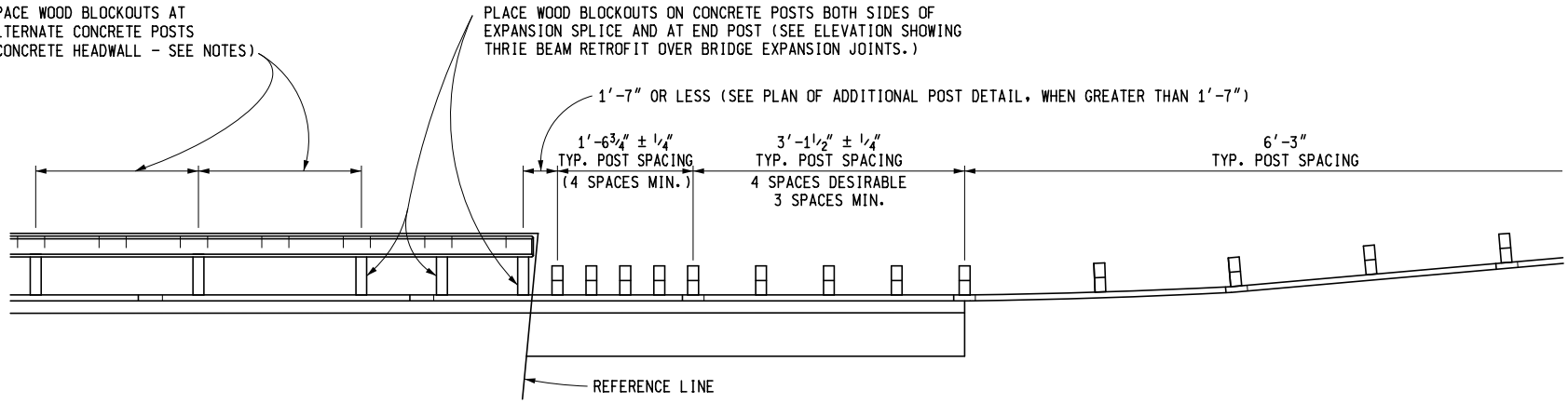
PLAN



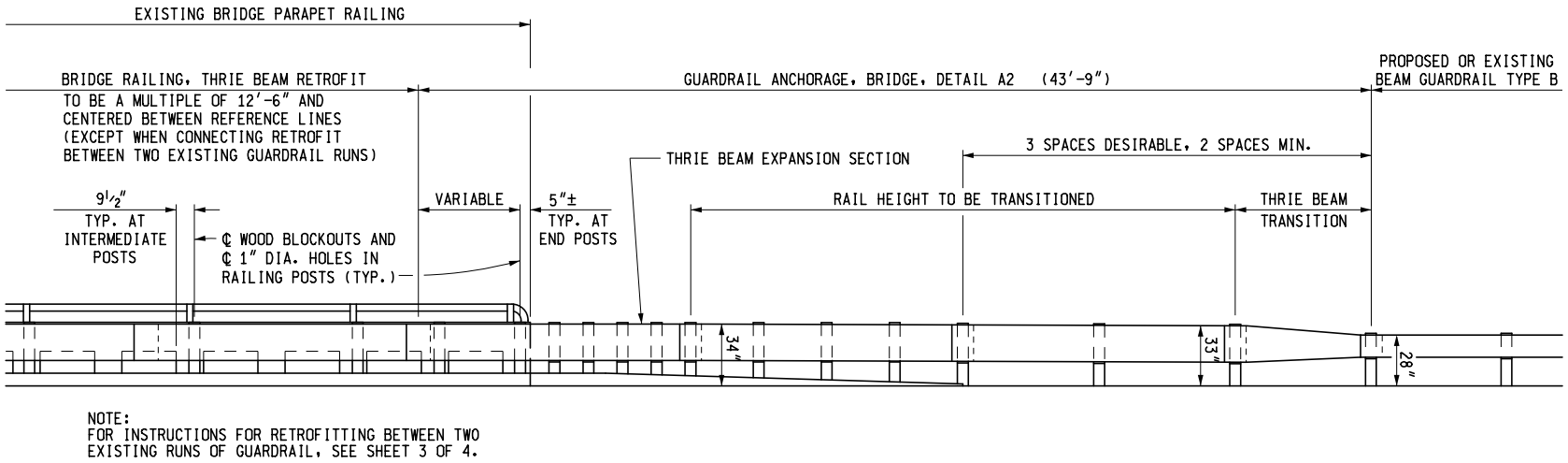
ELEVATION

BRIDGE RAILING, THRIE BEAM RETROFIT AND APPROACH GUARDRAIL

(FOR USE WITH BEAM GUARDRAIL, TYPE T, TYPE MGS-O, & TYPE MGS-8)



PLAN



NOTE:
FOR INSTRUCTIONS FOR RETROFITTING BETWEEN TWO
EXISTING RUNS OF GUARDRAIL, SEE SHEET 3 OF 4.

ELEVATION

BRIDGE RAILING, THRIE BEAM RETROFIT AND APPROACH GUARDRAIL
(FOR USE WITH GUARDRAIL, TYPE B)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

BRIDGE RAILING, THRIE BEAM RETROFIT

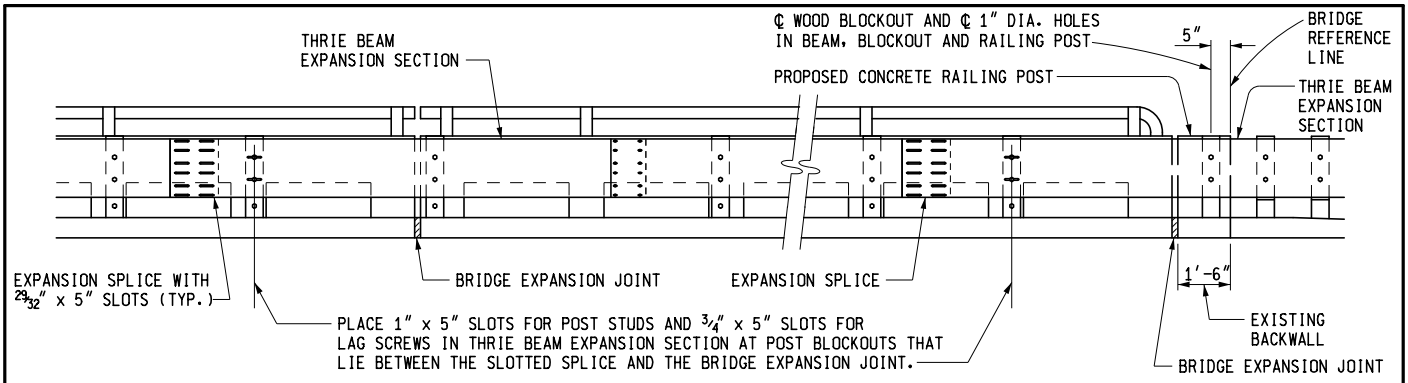
(OPEN PARAPET TYPE BRIDGE RAILING)

F.H.W.A. APPROVAL

2-5-2016
PLAN DATE

B-23-F

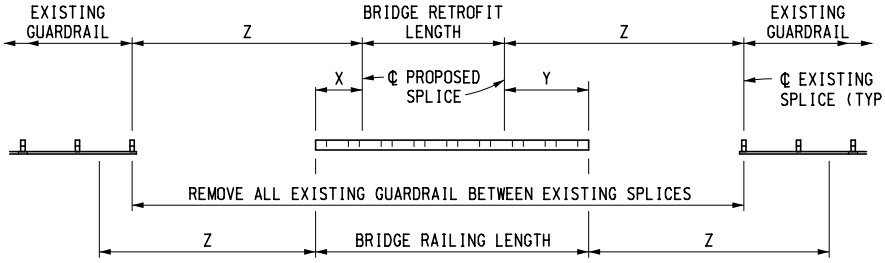
SHEET
2 OF 4



AT PIER OR ABUTMENT WITH RETURN WINGWALLS

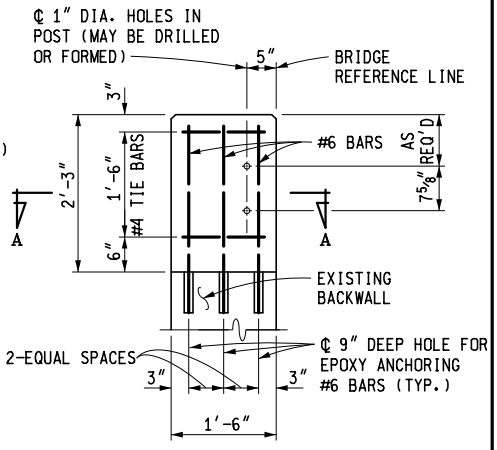
AT ABUTMENT WITH SLOPEWALLS

ELEVATION SHOWING THRIE BEAM RETROFIT OVER BRIDGE EXPANSION JOINTS



Z = 25'-0" WHEN CONNECTING TO BEAM GUARDRAIL TYPE T, TYPE MGS-0, AND TYPE MGS-8.
USE GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A1
OR
Z = 43'-9" WHEN CONNECTING TO BEAM GUARDRAIL TYPE B.
USE GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A2.

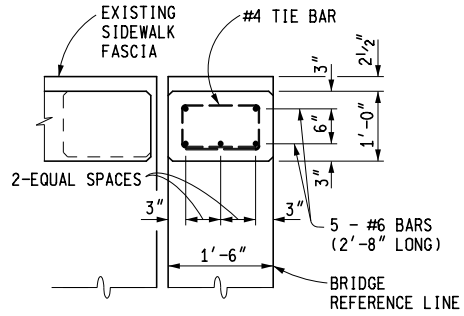
SKETCH FOR RETROFITTING BETWEEN TWO EXISTING RUNS OF GUARDRAIL



ELEVATION

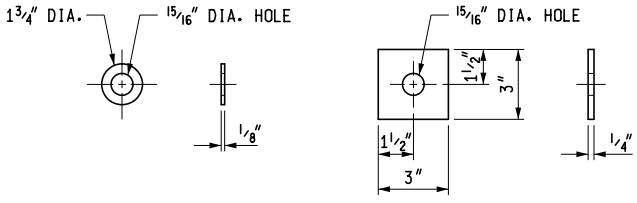
INSTRUCTIONS FOR LAYING OUT RETROFIT BETWEEN TWO EXISTING RUNS OF GUARDRAIL

1. MEASURE THE APPROPRIATE "Z" DISTANCE FROM ONE END OF THE BRIDGE RAILING AND LOCATE THE FIRST EXISTING SPLICE BACK TOWARD THE BRIDGE.
2. FROM THIS SPLICE, MEASURE THE SAME "Z" DISTANCE BACK TOWARD THE BRIDGE TO OBTAIN THE "X" DIMENSION. THIS DIMENSION WILL VARY FROM 0 TO 12'-6".
3. REPEAT STEPS 1 AND 2, FROM OPPOSITE END OF THE BRIDGE TO OBTAIN "Y" DIMENSION.
4. SUBTRACT THE SUM OF "X" + "Y" FROM BRIDGE RAILING LENGTH. THIS WILL BE THE BRIDGE RETROFIT LENGTH.
5. DIVIDE THE BRIDGE RETROFIT LENGTH BY 12'-6" TO OBTAIN THE NUMBER OF BEAM ELEMENTS PLUS A REMAINDER. THE REMAINDER WILL BE THE LENGTH OF A SHORTENED ELEMENT.
6. WHEN THE REMAINDER IS LESS THAN 2'-6", ADD 12'-6" TO THE REMAINDER AND DIVIDE BY TWO. THE BRIDGE RETROFIT WILL CONTAIN TWO SHORTENED BEAM ELEMENTS WITH ONE LESS 12'-6" BEAM ELEMENT THAN CALCULATED IN STEP 5.



SECTION A - A

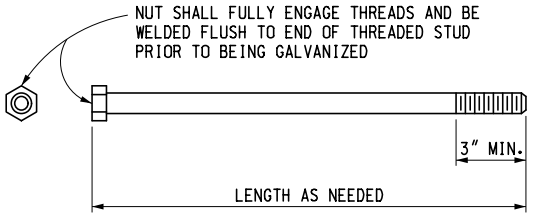
CONCRETE RAILING POST DETAIL



ROUND WASHER

SQUARE WASHER

WASHERS USED WITH 7/8" DIA. STUDS



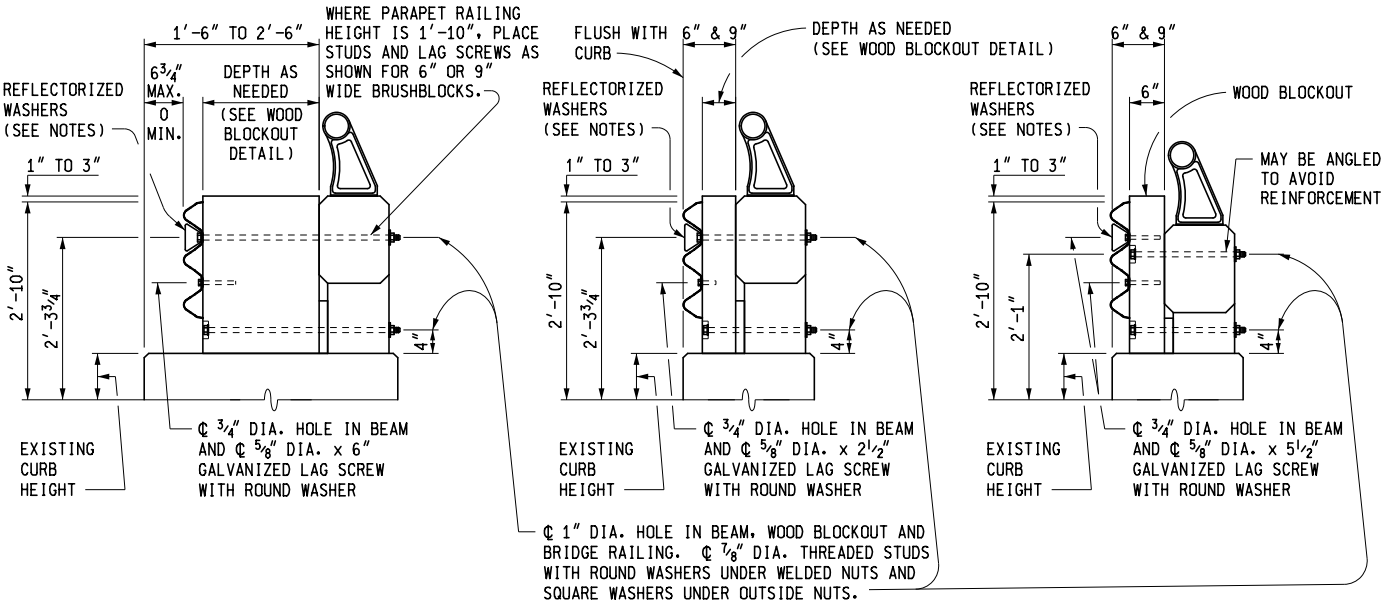
7/8" DIA. THREADED STUD

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

BRIDGE RAILING, THRIE BEAM RETROFIT

(OPEN PARAPET TYPE BRIDGE RAILING)

F.H.W.A. APPROVAL	2-5-2016 PLAN DATE	B-23-F	SHEET 3 OF 4

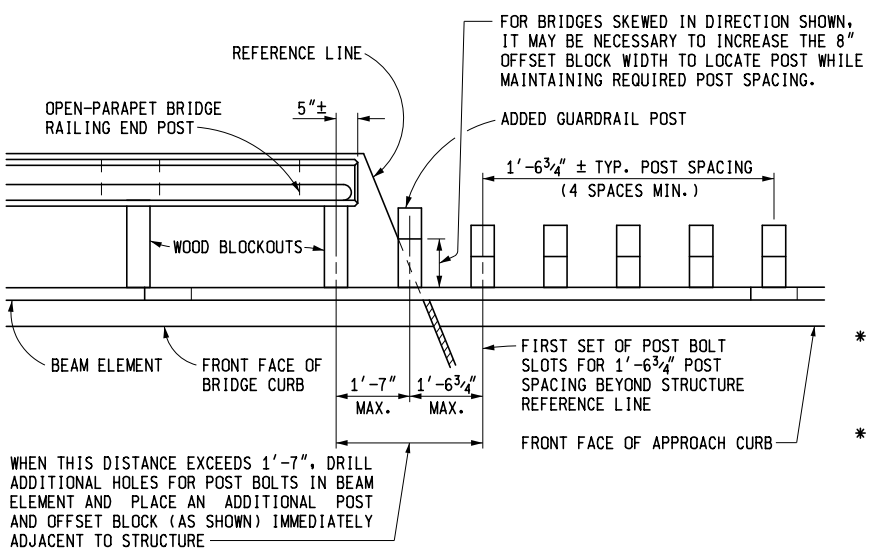


2'-3" HIGH PARAPET RAILING BEHIND 1'-6" TO 2'-6" WIDE BRUSHBLOCK

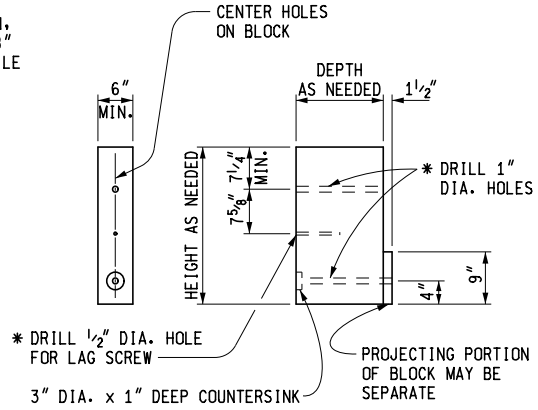
2'-3" HIGH PARAPET RAILING BEHIND 6" OR 9" WIDE BRUSHBLOCK

1'-10" HIGH PARAPET RAILING BEHIND 6" OR 9" WIDE BRUSHBLOCK

SECTIONS THRU PARAPET RAILING



PLAN OF ADDITIONAL POST DETAIL



* NOTE: HOLE LOCATIONS SHOWN ARE FOR 2'-3" HIGH PARAPET RAILING. WHERE REQUIRED, SEE SECTION THRU 1'-10" HIGH PARAPET RAILING

FRONT SIDE

WOOD BLOCKOUT DETAIL

WOOD BLOCKOUTS MAY BE MADE FROM A COMBINATION OF SEPARATE BLOCKS

NOTES:

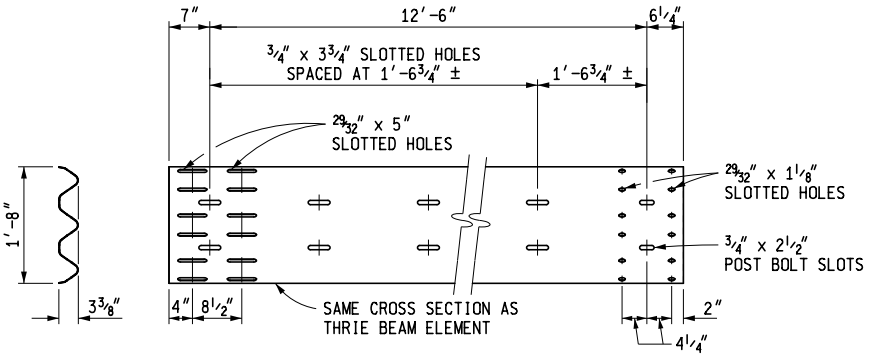
THIS STANDARD IS INTENDED FOR USE IN UPGRADING OF EXISTING OPEN-PARAPET TYPE BRIDGE RAILINGS AND APPROACH GUARDRAIL.

BRIDGE RAILING, THRIE BEAM RETROFIT AND GUARDRAIL ANCHORAGES SHALL CONFORM TO THE CURRENT STANDARD PLAN R-60 SERIES, WHERE APPLICABLE, EXCEPT AS SHOWN ON THIS PLAN.

ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WTH SECTIONS 807 & 908 OF THE STANDARD SPECIFICATIONS.

REFLECTORIZED WASHERS SHALL BE SPACED AT 25'-0" INTERVALS AT BEAM ELEMENT SPLICES. THEY SHALL BE ATTACHED AT UPPER POST BOLT SLOTS WITH STANDARD SPLICE BOLTS.

FOR PRECAST THREE SIDED OR ARCH CULVERTS SPACE BLOCKOUTS FOR THRIE BEAM GUARDRAIL AT A DISTANCE OF 10'-7¾" OR LESS CENTER TO CENTER. PLACE FIRST AND LAST BLOCK ON HEADWALL AS DETAILED ON THIS STANDARD.



THRIE BEAM EXPANSION SECTION

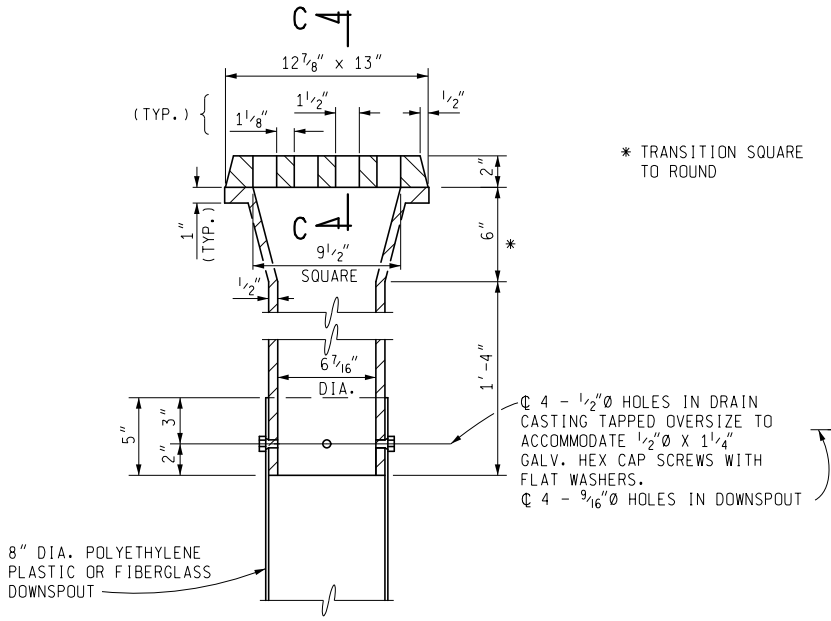
MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

BRIDGE RAILING, THRIE BEAM RETROFIT

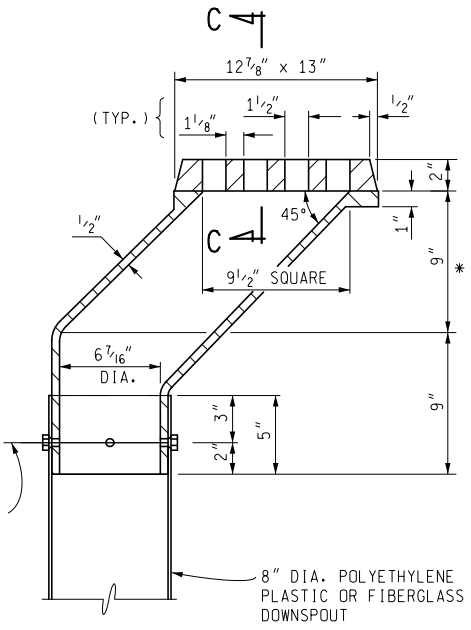
(OPEN PARAPET TYPE BRIDGE RAILING)

F.H.W.A. APPROVAL	2-5-2016 PLAN DATE	B-23-F	SHEET 4 OF 4



SECTION A-A (TYPE 1)

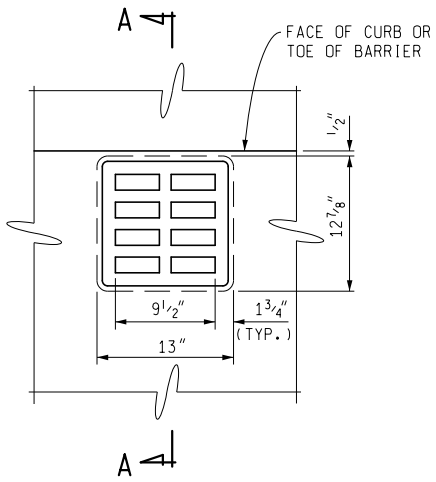
* TRANSITION SQUARE TO ROUND



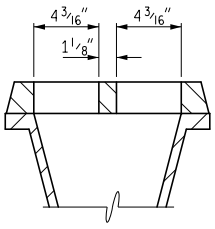
SECTION A-A (TYPE 2)

DRAIN CASTING ASSEMBLY DETAILS

(BRACKETS NOT SHOWN)



PLAN OF DRAIN CASTING



SECTION C-C

NOTES:

DRAIN CASTINGS SHALL BE PLACED WITH SLOTS AS SHOWN ON PLANS. NO ROTATION OF DRAIN CASTINGS WILL BE PERMITTED.

BOTTOM OF DOWNSPOUT SHALL BE 6"± BELOW BOTTOM FLANGE OF BEAM OR GIRDER.

A BRACKET SHALL BE USED WHEN GIRDER DEPTH IS 42" OR GREATER AND SHALL BE LOCATED 6" ABOVE THE BOTTOM FLANGE OF GIRDER.

DRAIN CASTINGS SHALL BE GRAY IRON CASTINGS IN ACCORDANCE WITH ASTM A48, CLASS 35B.

POLYETHYLENE PLASTIC PIPE MUST MEET THE REQUIREMENTS OF ASTM F 714, PE 4710, DR 26.

FIBERGLASS PIPE AND FITTINGS SHALL BE REINFORCED THERMOSETTING RESIN PIPE QUALIFYING FOR A 30,000 PSI MINIMUM SHORT TERM RUPTURE STRENGTH HOOPS TENSILE STRESS. THE PIPE SHALL BE IN ACCORDANCE TO ASTM D2996.

STEEL FOR BRACKETS SHALL BE ASTM A36, GALVANIZED.

FASTENERS SHALL MEET THE REQUIREMENTS OF ASTM A307, GALVANIZED.

WASHERS SHALL MEET THE REQUIREMENTS OF ASTM F844, GALVANIZED.

GALVANIZING SHALL BE BY THE HOT DIP PROCESS IN ACCORDANCE WITH 7.07 OF THE STANDARD SPECIFICATIONS. ALL FABRICATION SHALL BE COMPLETED BEFORE GALVANIZING.

CONCRETE INSERTS AND BOLT HOLES IN DRAIN CASTINGS SHALL BE TAPPED OVERSIZE IN ACCORDANCE WITH ASTM A563.

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: V.Z.

DEPARTMENT DIRECTOR
Kirk T. Steudle

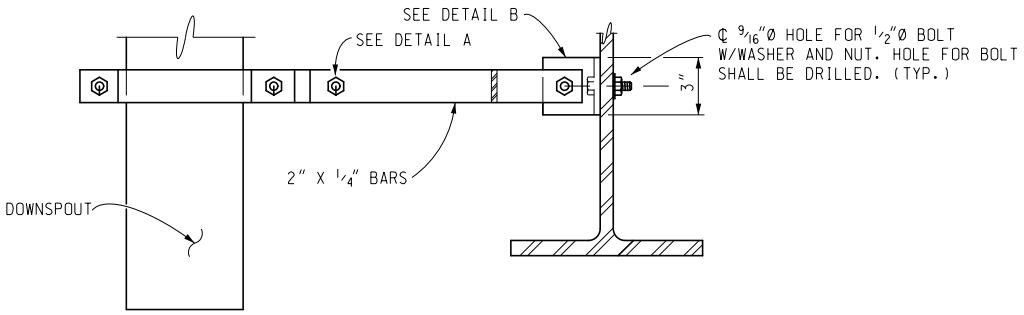
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

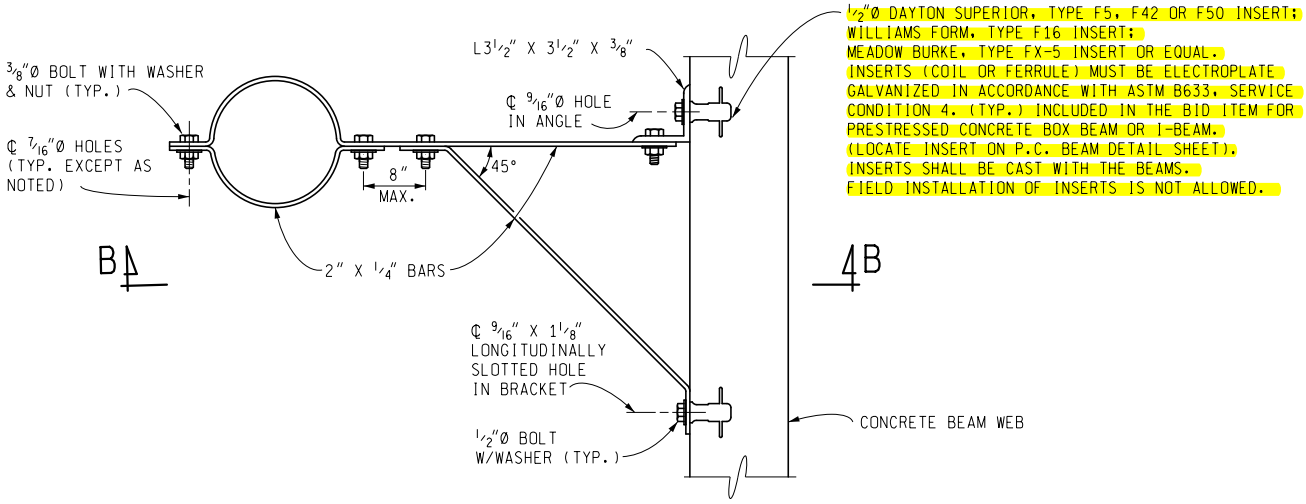
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DRAIN CASTING ASSEMBLY DETAILS

F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	B-101-G	SHEET 1 OF 2

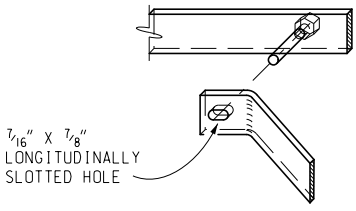


SECTION B-B
(ANCHORED TO STEEL BEAM WEB)

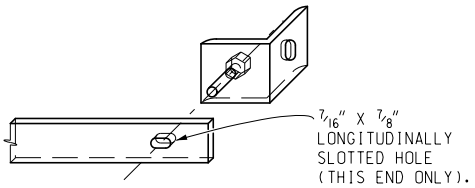


PLAN VIEW OF BRACKET
(ANCHORED TO CONCRETE BEAM WEB)

BRACKET DETAILS
(FOR CONCRETE OR STEEL BEAMS)



DETAIL A

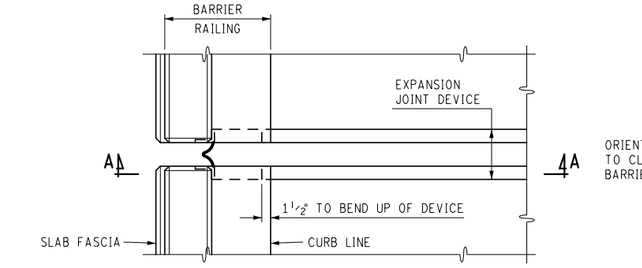


DETAIL B

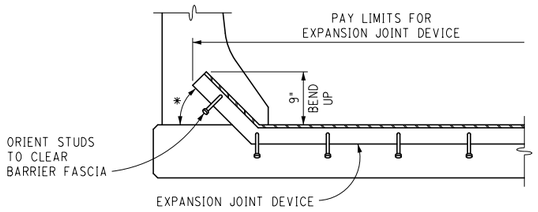
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DRAIN CASTING ASSEMBLY DETAILS

F.H.W.A. APPROVAL	2-8-2016 PLAN DATE	B-101-G	SHEET 2 OF 2

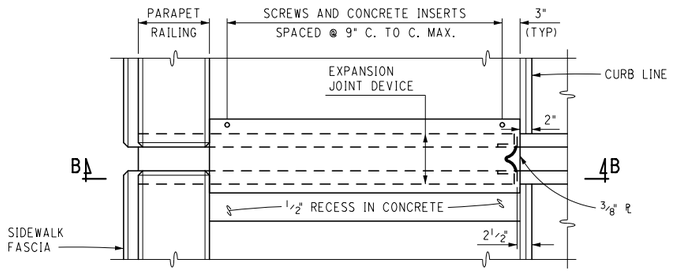


PLAN AT BARRIER RAILING

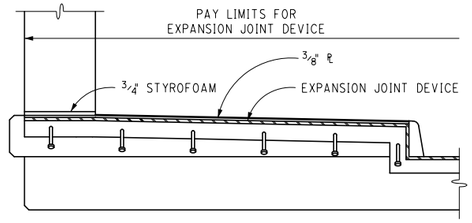


SECTION A – A

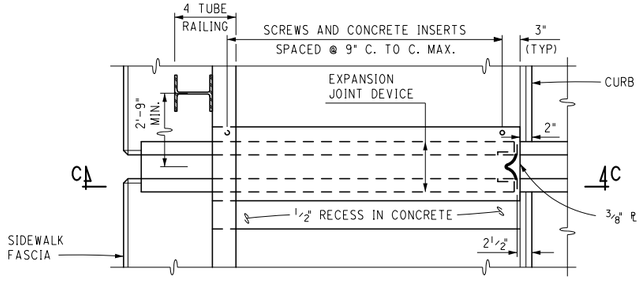
* BEND ANCHORAGE UP 45° ALONG ℄ OF EXPANSION JOINT.



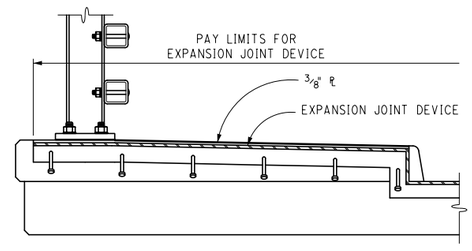
PLAN AT PARAPET RAILING WITH SIDEWALK



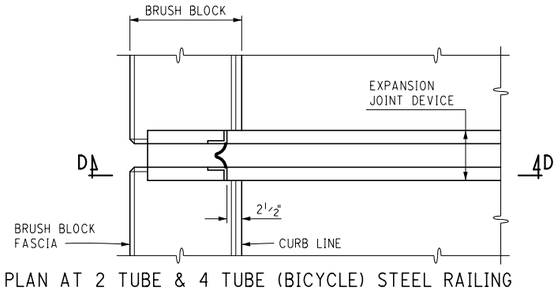
SECTION B – B



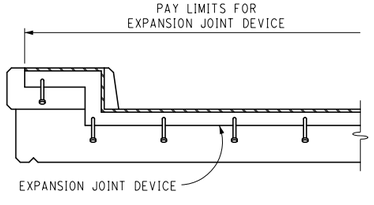
PLAN AT 4 TUBE (PEDESTRAIN) STEEL RAILING



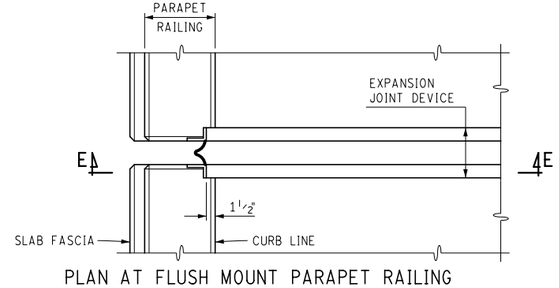
SECTION C – C



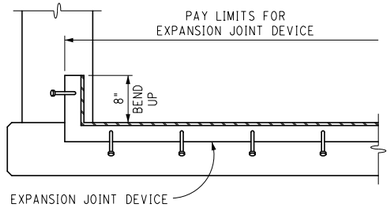
PLAN AT 2 TUBE & 4 TUBE (BICYCLE) STEEL RAILING



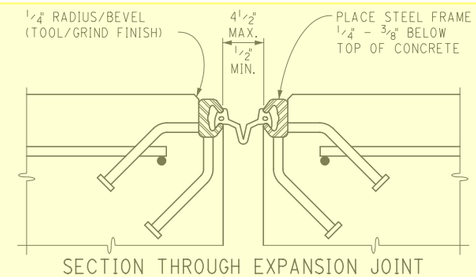
SECTION D – D



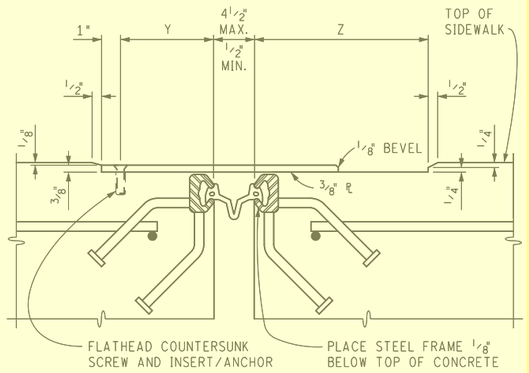
PLAN AT FLUSH MOUNT PARAPET RAILING



SECTION E – E



SECTION THROUGH EXPANSION JOINT



SECTION THROUGH EXPANSION JOINT
AND COVER PLATE

WABO STRIP SEAL TYPE M			
TOTAL TRAVEL *	PLATE WIDTH	Y	Z
< 1"	10"	3 3/4"	5 3/4"
1" – 2"	11"	3 3/4"	6 3/4"
2" – 3"	12"	3 3/4"	7 3/4"
> 3"	13"	3 3/4"	8 3/4"

ALL OTHER DEVICES			
TOTAL TRAVEL *	PLATE WIDTH	Y	Z
< 1 1/2"	8"	2 1/2"	5"
1 1/2" – 3 1/2"	10"	2 1/2"	7"
> 3 1/2"	12"	2 1/2"	9"

* SEE TABLE FOR MINIMUM TOTAL TRAVEL ALONG CENTERLINE OF BRIDGE

SIDEWALK SECTIONS

ALL STEEL FOR COVER PLATE SHALL BE AASHTO M270, GRADE 36, MEET THE REQUIREMENTS OF ASTM A786 AND GALVANIZED (ASTM A123).

USE ASTM F 593 (TYPE 304) STAINLESS STEEL 3/4" OR 1/2" DIAMETER FLATHEAD COUNTERSUNK SCREWS WITH 3/4" OR 1/2" DIAMETER INSERTS OR FLUSH TYPE EXPANSION ANCHORS WITH A MINIMUM ALLOWABLE OR SAFE WORKING TENSION LOAD CAPACITY OF 1200 POUNDS.

CAST CURBS AND SIDEWALKS WITH 3/8" SLIDING PLATES IN PLACE TO INSURE THAT INSERTS AND SCREWS ARE ALIGNED PROPERLY. APPLY BOND BREAKER TO SLIDING PLATES PRIOR TO INSTALLATION.

FORM CONCRETE RECESS AREA IN SIDEWALK AND GRIND TO PROVIDE SMOOTH SURFACE. TOOL OR GRIND CONCRETE EDGES TO 1/4" RADIUS. APPLY ONE COAT OF EPOXY RESIN ADHESIVE TO ALLOW BENT SLIDING PLATE TO MOVE FREELY WITHOUT FRICTION. CARE SHALL BE TAKEN SO THAT NO ADHESIVE COMES IN CONTACT WITH ANY PART OF THE EXPANSION JOINT DEVICE OR GLAND. REMOVE ANY FOREIGN PARTICLES FROM THE SURFACE PRIOR TO INSTALLING PLATES.

INSTALL PLATES SO THAT THE SCREWS AND INSERTS ARE SET ON THE HIGH SIDE OF LONGITUDINAL SIDEWALK GRADE.

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE COVER PLATE IS INCLUDED IN THE PAYMENT FOR THE EXPANSION JOINT DEVICE COVER PLATE.

NOTES:

JOINT TYPES

THE EXPANSION JOINT DEVICE SHALL BE OF A TYPE THAT INCLUDES A CONTINUOUS NEOPRENE (OR EQUIVALENT) SEAL ACROSS THE DECK. UNLESS OTHERWISE NOTED ON THE PLANS, THE CONTRACTOR HAS THE OPTION OF USING ANY OF THE DEVICES LISTED BELOW:

DEVICE	MANUFACTURER
WABO STRIP SEAL – TYPE M	WATSON-BOWMAN & ACME, INC.
WABO STRIP SEAL – TYPE A	WATSON-BOWMAN & ACME, INC.
STEELFLEX-SSA2	D.S. BROWN
STEELFLEX-SSCM	D.S. BROWN
ONFLEX 40 SS	STRUCTURAL RUBBER PRODUCTS CO.
ONFLEX 40 SSA	STRUCTURAL RUBBER PRODUCTS CO.

THE MODEL OF THE JOINT TYPE SELECTED SHALL BE SUITABLE TO ACCOMMODATE THE TOTAL MOVEMENT NOTED ON THE PLANS.

COMPLETE WORKING DRAWINGS OF ALL DETAILS OF FABRICATION OF THE EXPANSION JOINT DEVICE SHALL BE SUBMITTED FOR REVIEW IN ACCORDANCE WITH STANDARD SPECIFICATION 104.02. THIS REQUIREMENT IS WAIVED FOR EXPANSION JOINT DEVICES FOR WHICH A SET OF STANDARD INSTALLATION DETAILS HAS BEEN APPROVED. STANDARD INSTALLATION DETAILS CAN BE OBTAINED FROM THE DESIGN DIVISION.

FABRICATION AND INSTALLATION

REMOVE SHIPPING BOLTS PRIOR TO PLACEMENT OF CONCRETE.

THE EXPANSION JOINT SHALL BE SHOP FABRICATED TO CONFORM TO THE CONTOUR OF THE BRIDGE DECK, BARRIERS, ETC. IT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SUBJECT TO NOTES HEREIN AND THE APPROVAL OF THE ENGINEER.

TIE DECK REINFORCING STEEL TO STEEL FRAME ANCHORS TO MAXIMUM EXTENT PRACTICABLE WITHOUT DAMAGING GALVANIZED OR EPOXY COATINGS.

THE TOP OF THE EXPANSION JOINT DEVICE SHALL BE SET 1/4" – 3/8" BELOW THE CONCRETE SLAB (PAVEMENT).

THE STEEL ANCHORAGE FOR STRIP SEAL GLANDS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH SUBSECTION 707.03C.17 OF THE STANDARD SPECIFICATIONS.

THE AREA OF THE STEEL ANCHORAGE AND SEALING GLAND WHICH WILL BE IN CONTACT WITH A SEALANT, OR LUBRICANT-ADHESIVE SHALL BE CLEANED WITH TOLUENE OR OTHER APPROVED SOLVENT.

IN THE EVENT THAT SPLICING IS REQUIRED OF THE SEALING GLAND, IT SHALL BE SPLICED BY AN APPROVED METHOD (SUCH AS COLD VULCANIZATION) BY A TRAINED REPRESENTATIVE OF THE MANUFACTURER.

DETAILS AT CURBS OR BARRIERS

THE DETAILS ON THIS SHEET SHOW AN APPROVED MEANS OF TERMINATING THE EXPANSION JOINT DEVICE AT CURBS OR BARRIERS. VARIATIONS OR ALTERNATIVE SCHEMES WILL BE CONSIDERED AND MAY BE USED IF APPROVED BY THE ENGINEER.

MATERIALS

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE EXPANSION JOINT AND THE TERMINAL ASSEMBLIES AT THE CURBS, SIDEWALKS, OR BARRIERS IS INCLUDED IN THE PAYMENT FOR THE EXPANSION JOINT DEVICE.

STRUCTURE NUMBER	ANGLE OF CROSSING TO NEAREST 10°	LOCATION OF JOINT	MIN. TOT. TRAVEL ALONG CENTERLINE OF BRIDGE *	REQUIRED LENGTH OF EXPANSION JOINT DEVICE

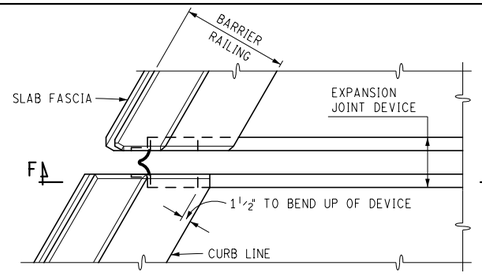
QUANTITY		
ITEM	UNIT	AMOUNT
Expansion Joint Device	Ft	
Expansion Joint Device, Cover Plate	Ft	

FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

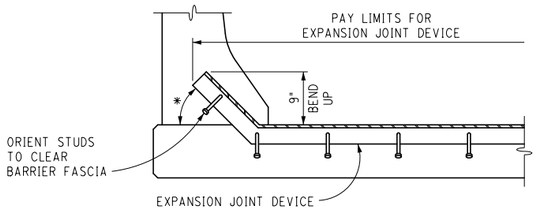
MDOT Michigan Department of Transportation

NO SCALE

	DATE:	CS:	EXPANSION JOINT DETAILS	DRAWING	SHEET
	DESIGN UNIT:	JN:	EJ3AB (02-10-2016)		SECT 2
FILE:	TSC:				

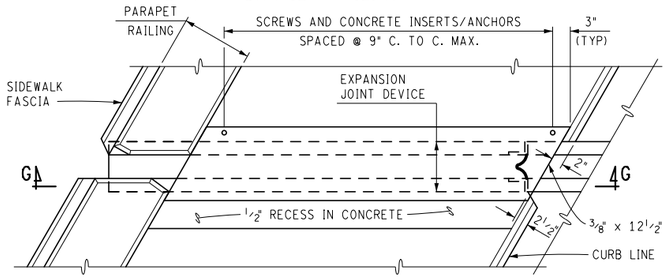


PLAN AT BARRIER RAILING

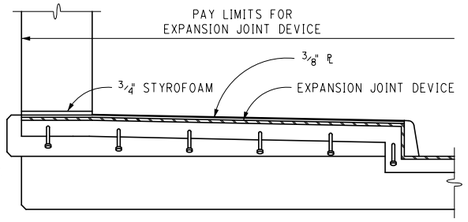


SECTION F – F

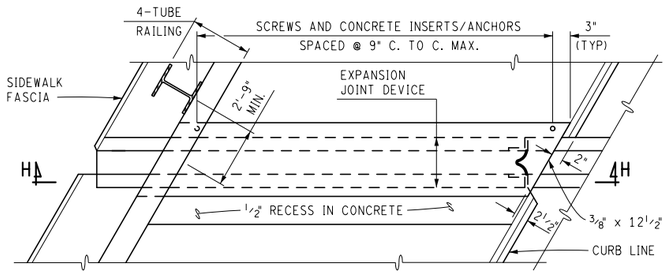
* FOR ANGLES OF CROSSING FROM 69° TO 45° INCLUSIVE, BEND ANCHORAGE UP 45° ALONG ℄ OF EXPANSION JOINT. FOR ANGLES OF CROSSING LESS THAN 45°, A SPECIAL ENDING MAY BE REQUIRED.



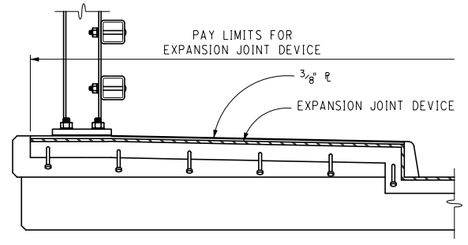
PLAN AT PARAPET RAILING WITH SIDEWALK



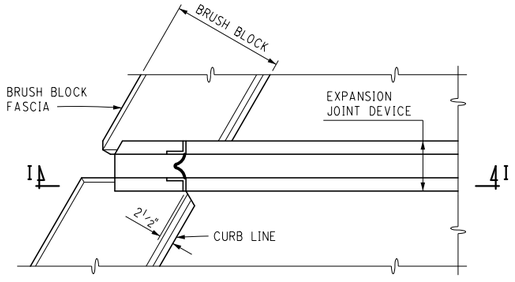
SECTION G – G



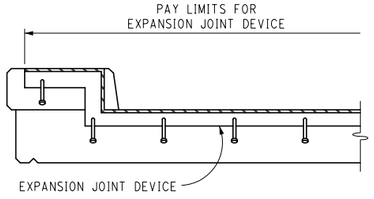
PLAN AT 4 TUBE (PEDESTRIAN) STEEL RAILING



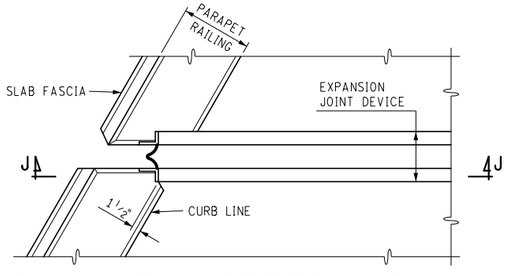
SECTION H – H



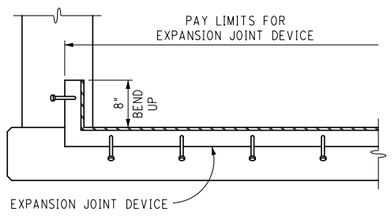
PLAN AT 2 TUBE & 4 TUBE (BICYCLE) STEEL RAILING



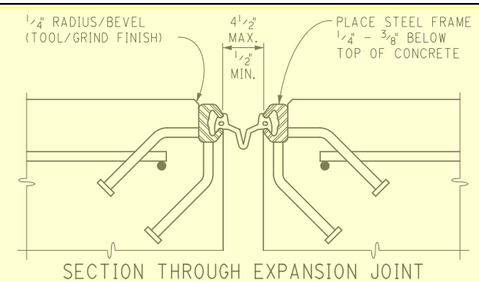
SECTION I – I



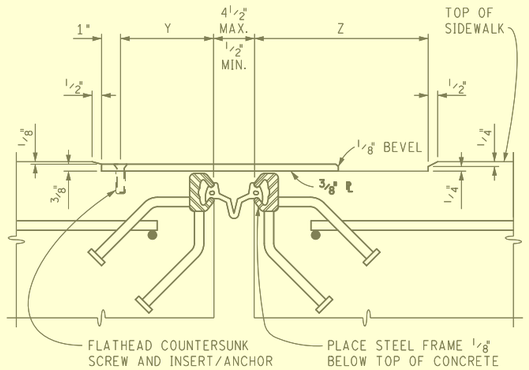
PLAN AT FLUSH MOUNT PARAPET RAILING



SECTION J – J



SECTION THROUGH EXPANSION JOINT



SECTION THROUGH EXPANSION JOINT AND COVER PLATE

WABO STRIP SEAL TYPE M			
TOTAL TRAVEL *	PLATE WIDTH	Y	Z
< 1"	10"	3¾"	5¾"
1" – 2"	11"	3¾"	6¾"
2" – 3"	12"	3¾"	7¾"
> 3"	13"	3¾"	8¾"

ALL OTHER DEVICES			
TOTAL TRAVEL *	PLATE WIDTH	Y	Z
< 1½"	8"	2½"	5"
1½" – 3½"	10"	2½"	7"
> 3½"	12"	2½"	9"

* SEE TABLE FOR MINIMUM TOTAL TRAVEL ALONG CENTERLINE OF BRIDGE

SIDEWALK SECTIONS

ALL STEEL FOR COVER PLATE SHALL BE AASHTO M270, GRADE 36, MEET THE REQUIREMENTS OF ASTM A786 AND GALVANIZED (ASTM A123).

USE ASTM F 593 (TYPE 304) STAINLESS STEEL ¾" OR ½" DIAMETER FLATHEAD COUNTERSUNK SCREWS WITH ¾" OR ½" DIAMETER INSERTS OR FLUSH TYPE EXPANSION ANCHORS WITH A MINIMUM ALLOWABLE OR SAFE WORKING TENSION LOAD CAPACITY OF 1200 POUNDS.

CAST CURBS AND SIDEWALKS WITH ⅜" SLIDING PLATES IN PLACE TO INSURE THAT INSERTS AND SCREWS ARE ALIGNED PROPERLY. APPLY BOND BREAKER TO SLIDING PLATES PRIOR TO INSTALLATION.

FORM CONCRETE RECESS AREA IN SIDEWALK AND GRIND TO PROVIDE SMOOTH SURFACE. TOOL OR GRIND CONCRETE EDGES TO ¼" RADIUS. APPLY ONE COAT OF EPOXY RESIN ADHESIVE TO ALLOW BENT SLIDING PLATE TO MOVE FREELY WITHOUT FRICTION. CARE SHALL BE TAKEN SO THAT NO ADHESIVE COMES IN CONTACT WITH ANY PART OF THE EXPANSION JOINT DEVICE OR GLAND. REMOVE ANY FOREIGN PARTICLES FROM THE SURFACE PRIOR TO INSTALLING PLATES.

INSTALL PLATES SO THAT THE SCREWS AND INSERTS ARE SET ON THE HIGH SIDE OF LONGITUDINAL SIDEWALK GRADE.

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE COVER PLATE IS INCLUDED IN THE PAYMENT FOR THE EXPANSION JOINT DEVICE COVER PLATE.

NOTES:

JOINT TYPES

THE EXPANSION JOINT DEVICE SHALL BE OF A TYPE THAT INCLUDES A CONTINUOUS NEOPRENE (OR EQUIVALENT) SEAL ACROSS THE DECK. UNLESS OTHERWISE NOTED ON THE PLANS, THE CONTRACTOR HAS THE OPTION OF USING ANY OF THE DEVICES LISTED BELOW:

DEVICE	MANUFACTURER
WABO STRIP SEAL – TYPE M	WATSON-BOWMAN & ACME, INC.
WABO STRIP SEAL – TYPE A	WATSON-BOWMAN & ACME, INC.
STEELFLEX-SSA2	D.S. BROWN
STEELFLEX-SSCM	D.S. BROWN
ONFLEX 40 SS	STRUCTURAL RUBBER PRODUCTS CO.
ONFLEX 40 SSA	STRUCTURAL RUBBER PRODUCTS CO.

THE MODEL OF THE JOINT TYPE SELECTED SHALL BE SUITABLE TO ACCOMMODATE THE TOTAL MOVEMENT NOTED ON THE PLANS.

COMPLETE WORKING DRAWINGS OF ALL DETAILS OF FABRICATION OF THE EXPANSION JOINT DEVICE SHALL BE SUBMITTED FOR REVIEW IN ACCORDANCE WITH STANDARD SPECIFICATION 104.02. THIS REQUIREMENT IS WAIVED FOR EXPANSION JOINT DEVICES FOR WHICH A SET OF STANDARD INSTALLATION DETAILS HAS BEEN APPROVED. STANDARD INSTALLATION DETAILS CAN BE OBTAINED FROM THE DESIGN DIVISION.

FABRICATION AND INSTALLATION

REMOVE SHIPPING BOLTS PRIOR TO PLACEMENT OF CONCRETE.

THE EXPANSION JOINT SHALL BE SHOP FABRICATED TO CONFORM TO THE CONTOUR OF THE BRIDGE DECK, BARRIERS, ETC. IT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SUBJECT TO NOTES HEREIN AND THE APPROVAL OF THE ENGINEER.

TIE DECK REINFORCING STEEL TO STEEL FRAME ANCHORS TO MAXIMUM EXTENT PRACTICABLE WITHOUT DAMAGING GALVANIZED OR EPOXY COATINGS.

THE TOP OF THE EXPANSION JOINT DEVICE SHALL BE SET ¼" – ⅜" BELOW THE CONCRETE SLAB (PAVEMENT).

THE STEEL ANCHORAGE FOR STRIP SEAL GLANDS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH SUBSECTION 707.03C.17 OF THE STANDARD SPECIFICATIONS.

THE AREA OF THE STEEL ANCHORAGE AND SEALING GLAND WHICH WILL BE IN CONTACT WITH A SEALANT, OR LUBRICANT-ADHESIVE SHALL BE CLEANED WITH TOLUENE OR OTHER APPROVED SOLVENT.

IN THE EVENT THAT SPLICING IS REQUIRED OF THE SEALING GLAND, IT SHALL BE SPLICED BY AN APPROVED METHOD (SUCH AS COLD VULCANIZATION) BY A TRAINED REPRESENTATIVE OF THE MANUFACTURER.

DETAILS AT CURBS OR BARRIERS

THE DETAILS ON THIS SHEET SHOW AN APPROVED MEANS OF TERMINATING THE EXPANSION JOINT DEVICE AT CURBS OR BARRIERS. VARIATIONS OR ALTERNATIVE SCHEMES WILL BE CONSIDERED AND MAY BE USED IF APPROVED BY THE ENGINEER.

MATERIALS

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE EXPANSION JOINT AND THE TERMINAL ASSEMBLIES AT THE CURBS, SIDEWALKS, OR BARRIERS IS INCLUDED IN THE PAYMENT FOR THE EXPANSION JOINT DEVICE.

STRUCTURE NUMBER	ANGLE OF CROSSING TO NEAREST 10°	LOCATION OF JOINT	MIN. TOT. TRAVEL ALONG CENTERLINE OF BRIDGE *	REQUIRED LENGTH OF EXPANSION JOINT DEVICE

QUANTITY		
ITEM	UNIT	AMOUNT
Expansion Joint Device	Ft	
Expansion Joint Device, Cover Plate	Ft	

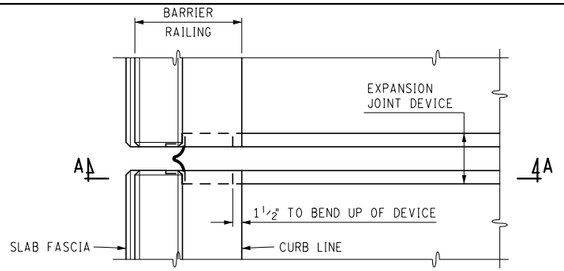
FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation

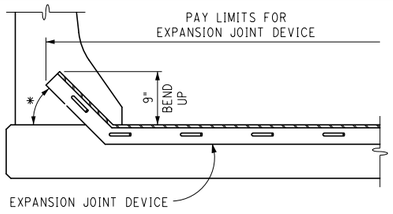
NO SCALE

	DATE:	CS:	EXPANSION JOINT DETAILS
	DESIGN UNIT:	JN:	EJ3AB (02-10-2016)
FILE:	TSC:		

DRAWING | SHEET SECT 2

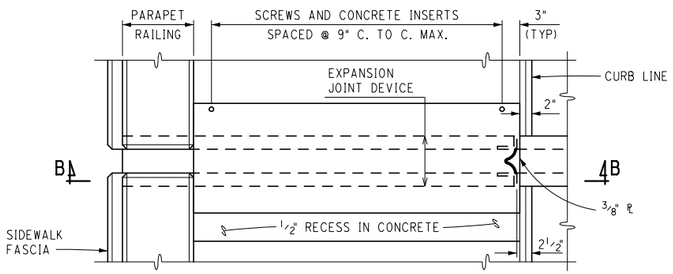


PLAN AT BARRIER RAILING

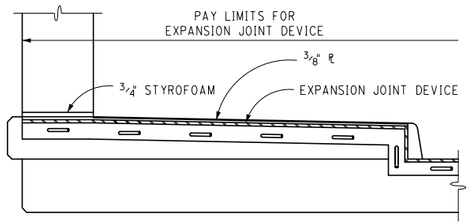


SECTION A – A

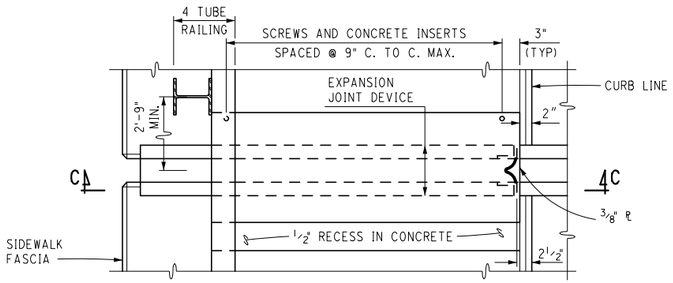
* BEND ANCHORAGE UP 45° ALONG ℄ OF EXPANSION JOINT.



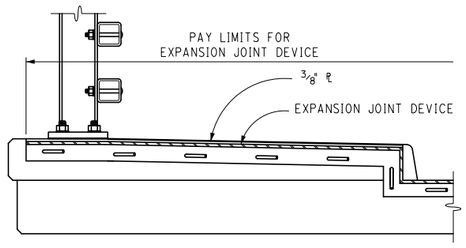
PLAN AT PARAPET RAILING WITH SIDEWALK



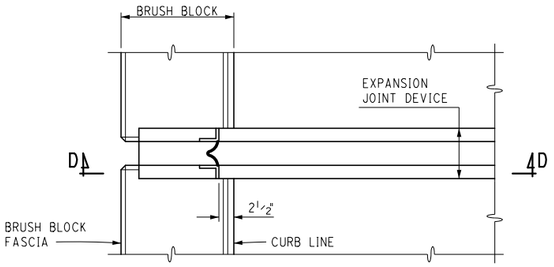
SECTION B – B



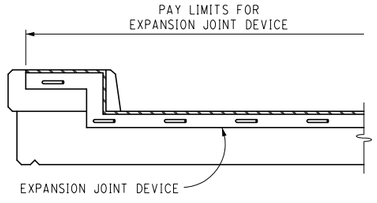
PLAN AT 4 TUBE (PEDESTRAIN) STEEL RAILING



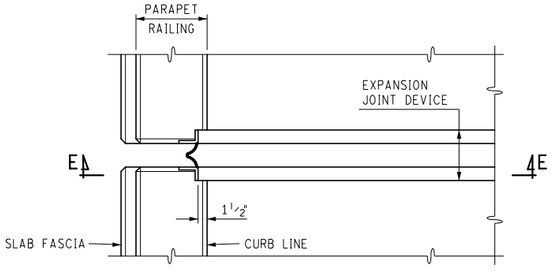
SECTION C – C



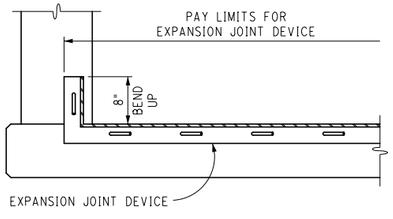
PLAN AT 2 TUBE & 4 TUBE (BICYCLE) STEEL RAILING



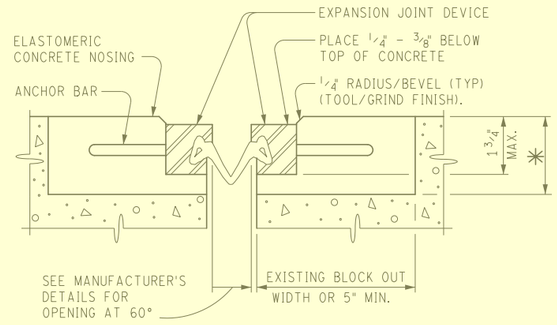
SECTION D – D



PLAN AT FLUSH MOUNT PARAPET RAILING



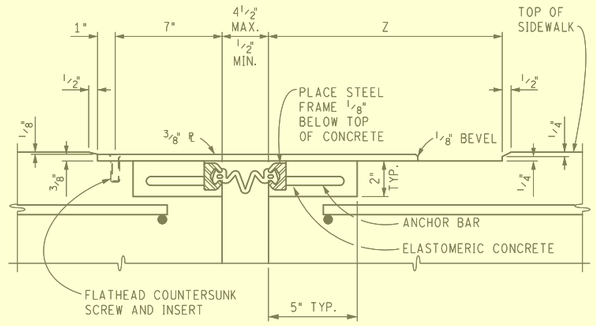
SECTION E – E



* EXISTING BLOCK OUT DEPTH OR 2" MIN.

SECTION THROUGH EXPANSION JOINT

THE MINIMUM BLOCK OUT DIMENSIONS SHOWN ARE APPLICABLE FOR DEVICES WITH STRIP SEALS ONLY.



SECTION THROUGH EXPANSION JOINT AND COVER PLATE

TOTAL TRAVEL *	PLATE WIDTH	Z
≤ 1"	15"	7"
1" – 2"	16"	8"
2" – 3"	17"	9"
≥ 3"	18"	10"

* SEE TABLE FOR MINIMUM TOTAL TRAVEL ALONG CENTERLINE OF BRIDGE

SIDEWALK SECTIONS

ALL STEEL FOR EXPANSION JOINT AND COVER PLATE SHALL BE AASHTO M270, GRADE 36, AND GALVANIZED (ASTM A123) WITH A STATIC COEFFICIENT OF FRICTION OF 0.6 OR GREATER.

USE ASTM F 593 (TYPE 304) STAINLESS STEEL ¾" DIAMETER FLATHEAD COUNTERSUNK SCREWS WITH ¾" DIAMETER INSERTS.

CAST CURBS AND SIDEWALKS WITH 3/8" SLIDING PLATES IN PLACE TO INSURE THAT INSERTS AND SCREWS ARE ALIGNED PROPERLY. APPLY BOND BREAKER TO SLIDING PLATES PRIOR TO INSTALLATION.

FORM CONCRETE RECESS AREA IN SIDEWALK AND GRIND TO PROVIDE SMOOTH SURFACE. TOOL OR GRIND CONCRETE EDGES TO ¼" RADIUS. APPLY ONE COAT OF EPOXY RESIN ADHESIVE TO ALLOW BENT SLIDING PLATE TO MOVE FREELY WITHOUT FRICTION. CARE SHALL BE TAKEN SO THAT NO ADHESIVE COMES IN CONTACT WITH ANY PART OF THE EXPANSION JOINT DEVISE OR GLAND. REMOVE ANY FOREIGN PARTICLES FROM THE SURFACE PRIOR TO INSTALLING PLATES.

INSTALL PLATES SO THAT THE SCREWS AND INSERTS ARE SET ON THE HIGH SIDE OF LONGITUDINAL SIDEWALK GRADE.

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE COVER PLATE IS INCLUDED IN THE PAYMENT FOR THE EXPANSION JOINT DEVICE COVER PLATE.

NOTES:

JOINT TYPES

THE EXPANSION JOINT DEVICE SHALL BE OF A TYPE THAT INCLUDES A CONTINUOUS NEOPRENE (OR EQUIVALENT) SEAL ACROSS THE DECK. UNLESS OTHERWISE NOTED ON THE PLANS, THE CONTRACTOR HAS THE OPTION OF USING ANY OF THE DEVICES LISTED BELOW:

DEVICE	MANUFACTURER
STEELFLEX-SSE2	D.S. BROWN CO..
WABO STRIP SEAL – TYPE E	WATSON-BOWMAN & ACME, INC.

THE MODEL OF THE JOINT TYPE SELECTED SHALL BE SUITABLE TO ACCOMMODATE THE TOTAL MOVEMENT NOTED ON THE PLANS.

COMPLETE WORKING DRAWINGS OF ALL DETAILS OF FABRICATION OF THE EXPANSION JOINT DEVICE SHALL BE SUBMITTED FOR REVIEW IN ACCORDANCE WITH STANDARD SPECIFICATION 104.02. THIS REQUIREMENT IS WAIVED FOR EXPANSION JOINT DEVICES FOR WHICH A SET OF STANDARD INSTALLATION DETAILS HAS BEEN APPROVED. STANDARD INSTALLATION DETAILS CAN BE OBTAINED FROM THE DESIGN DIVISION.

FABRICATION AND INSTALLATION

REMOVE SHIPPING BOLTS PRIOR TO PLACEMENT OF ELASTOMERIC CONCRETE.

THE EXPANSION JOINT SHALL BE SHOP FABRICATED TO CONFORM TO THE CONTOUR OF THE BRIDGE DECK, BARRIERS, ETC. IT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SUBJECT TO NOTES HEREIN AND THE APPROVAL OF THE ENGINEER.

THE TOP OF THE EXPANSION JOINT DEVICE SHALL BE SET ¼" – 3/8" BELOW THE CONCRETE SLAB (PAVEMENT).

THE STEEL ANCHORAGE FOR STRIP SEAL GLANDS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH SUBSECTION 707.03C.17 OF THE STANDARD SPECIFICATIONS.

THE ELASTOMERIC CONCRETE NOSING SHALL BE DELCRETE ELASTOMERIC CONCRETE.

THE AREA OF THE STEEL ANCHORAGE AND SEALING GLAND WHICH WILL BE IN CONTACT WITH A SEALANT, OR LUBRICANT-ADHESIVE SHALL BE CLEANED WITH TOLUENE OR OTHER APPROVED SOLVENT.

IN THE EVENT THAT SPLICING IS REQUIRED OF THE SEALING GLAND, IT SHALL BE SPLICED BY AN APPROVED METHOD (SUCH AS COLD VULCANIZATION) BY A TRAINED REPRESENTATIVE OF THE MANUFACTURER.

DETAILS AT CURBS OR BARRIERS

THE DETAILS ON THIS SHEET SHOW AN APPROVED MEANS OF TERMINATING THE EXPANSION JOINT DEVICE AT CURBS OR BARRIERS. VARIATIONS OR ALTERNATIVE SCHEMES WILL BE CONSIDERED AND MAY BE USED IF APPROVED BY THE ENGINEER.

MATERIALS

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE EXPANSION JOINT (INCLUDING ELASTOMERIC CONCRETE NOSING) AND THE TERMINAL ASSEMBLIES AT THE CURBS, SIDEWALKS OR BARRIER NOSING AND THE THE PAYMENT FOR THE EXPANSION JOINT DEVICE.

STRUCTURE NUMBER	ANGLE OF CROSSING TO NEAREST 10°	LOCATION OF JOINT	MIN. TOT. TRAVEL ALONG CENTERLINE OF BRIDGE *	REQUIRED LENGTH OF EXPANSION JOINT DEVICE

QUANTITY		
ITEM	UNIT	AMOUNT
Expansion Joint Device	Ft	
Expansion Joint Device, Cover Plate	Ft	

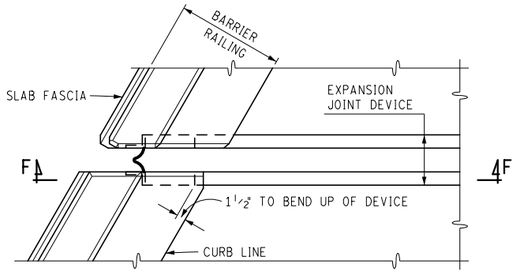
FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation

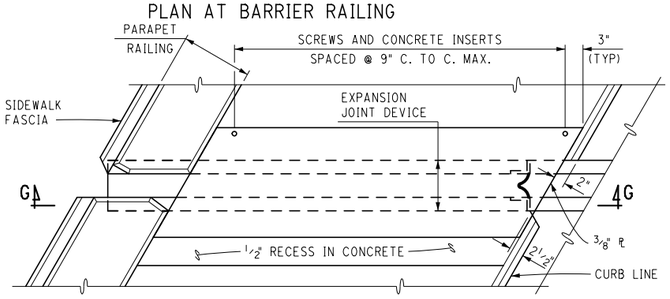
NO SCALE

	DATE:	CS:	EXPANSION JOINT DETAILS
	DESIGN UNIT:	JN:	EJ40 (02-10-2016)
FILE:	TSC:		

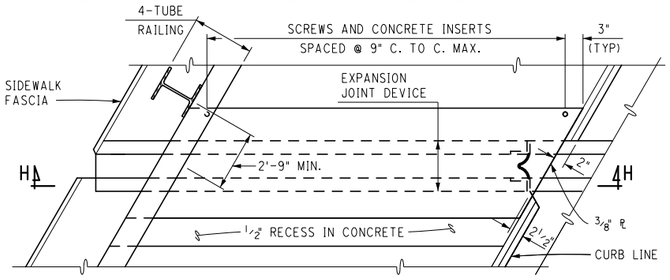
DRAWING | SHEET: SECT 2



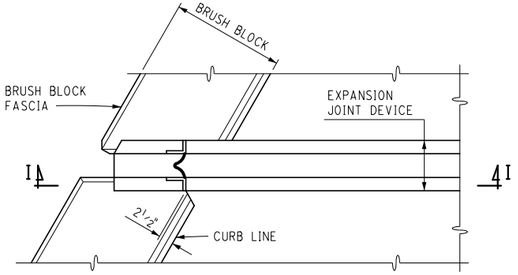
PLAN AT BARRIER RAILING



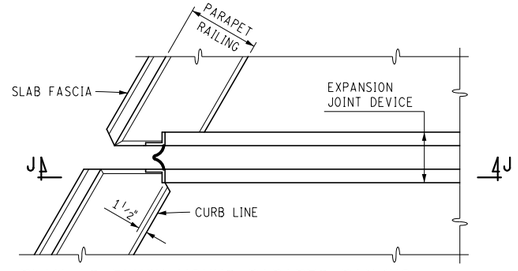
PLAN AT PARAPET RAILING WITH SIDEWALK



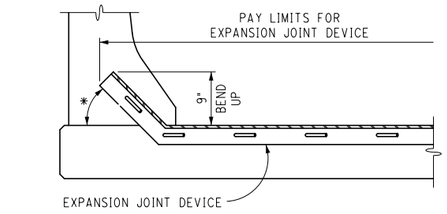
PLAN AT 4 TUBE (PEDESTRAIN) STEEL RAILING



PLAN AT 2 TUBE & 4 TUBE (BICYCLE) STEEL RAILING

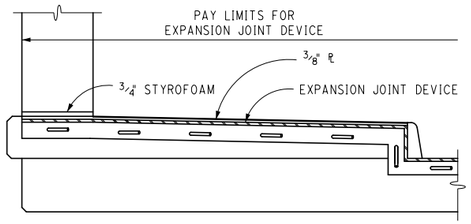


PLAN AT FLUSH MOUNT PARAPET RAILING

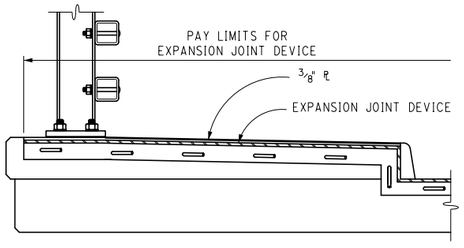


SECTION F - F

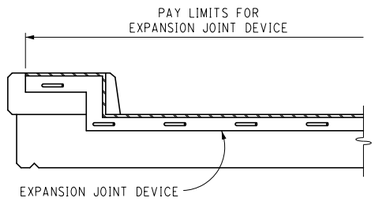
* FOR ANGLES OF CROSSING FROM 69° TO 45° INCLUSIVE, BEND ANCHORAGE UP 45° ALONG ℄ OF EXPANSION JOINT. FOR ANGLES OF CROSSING LESS THAN 45°, A SPECIAL ENDING MAY BE REQUIRED.



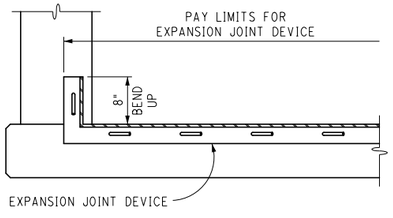
SECTION G - G



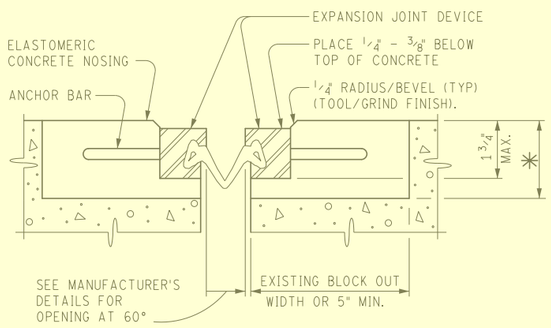
SECTION H - H



SECTION I - I



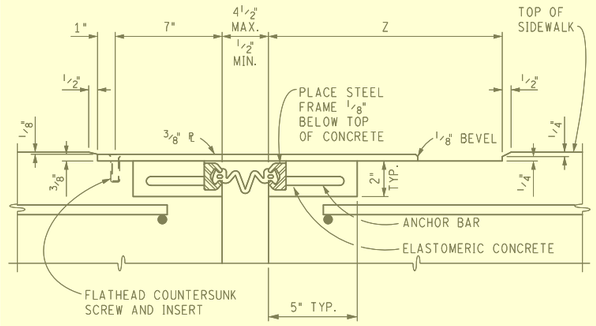
SECTION J - J



* EXISTING BLOCK OUT DEPTH OR 2" MIN.

SECTION THROUGH EXPANSION JOINT

THE MINIMUM BLOCK OUT DIMENSIONS SHOWN ARE APPLICABLE FOR DEVICES WITH STRIP SEALS ONLY.



SECTION THROUGH EXPANSION JOINT AND COVER PLATE

TOTAL TRAVEL *	PLATE WIDTH	Z
≤ 1"	15"	7"
1" - 2"	16"	8"
2" - 3"	17"	9"
≥ 3"	18"	10"

* SEE TABLE FOR MINIMUM TOTAL TRAVEL ALONG CENTERLINE OF BRIDGE

SIDEWALK SECTIONS

ALL STEEL FOR EXPANSION JOINT AND COVER PLATE SHALL BE AASHTO M270, GRADE 36, AND GALVANIZED (ASTM A123) WITH A STATIC COEFFICIENT OF FRICTION OF 0.6 OR GREATER.

USE ASTM F 593 (TYPE 304) STAINLESS STEEL ¾" DIAMETER FLATHEAD COUNTERSUNK SCREWS WITH ¾" DIAMETER INSERTS.

CAST CURBS AND SIDEWALKS WITH ⅜" SLIDING PLATES IN PLACE TO INSURE THAT INSERTS AND SCREWS ARE ALIGNED PROPERLY. APPLY BOND BREAKER TO SLIDING PLATES PRIOR TO INSTALLATION.

FORM CONCRETE RECESS AREA IN SIDEWALK AND GRIND TO PROVIDE SMOOTH SURFACE. TOOL OR GRIND CONCRETE EDGES TO ¼" RADIUS. APPLY ONE COAT OF EPOXY RESIN ADHESIVE TO ALLOW BENT SLIDING PLATE TO MOVE FREELY WITHOUT FRICTION. CARE SHALL BE TAKEN SO THAT NO ADHESIVE COMES IN CONTACT WITH ANY PART OF THE EXPANSION JOINT DEVISE OR GLAND. REMOVE ANY FOREIGN PARTICLES FROM THE SURFACE PRIOR TO INSTALLING PLATES.

INSTALL PLATES SO THAT THE SCREWS AND INSERTS ARE SET ON THE HIGH SIDE OF LONGITUDINAL SIDEWALK GRADE.

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE COVER PLATE IS INCLUDED IN THE PAYMENT FOR THE EXPANSION JOINT DEVICE COVER PLATE.

NOTES:

JOINT TYPES

THE EXPANSION JOINT DEVICE SHALL BE OF A TYPE THAT INCLUDES A CONTINUOUS NEOPRENE (OR EQUIVALENT) SEAL ACROSS THE DECK. UNLESS OTHERWISE NOTED ON THE PLANS, THE CONTRACTOR HAS THE OPTION OF USING ANY OF THE DEVICES LISTED BELOW:

DEVICE	MANUFACTURER
STEELFLEX-SSE2	D.S. BROWN CO..
WABO STRIP SEAL - TYPE E	WATSON-BOWMAN & ACME, INC.

THE MODEL OF THE JOINT TYPE SELECTED SHALL BE SUITABLE TO ACCOMMODATE THE TOTAL MOVEMENT NOTED ON THE PLANS.

COMPLETE WORKING DRAWINGS OF ALL DETAILS OF FABRICATION OF THE EXPANSION JOINT DEVICE SHALL BE SUBMITTED FOR REVIEW IN ACCORDANCE WITH STANDARD SPECIFICATION 104.02. THIS REQUIREMENT IS WAIVED FOR EXPANSION JOINT DEVICES FOR WHICH A SET OF STANDARD INSTALLATION DETAILS HAS BEEN APPROVED. STANDARD INSTALLATION DETAILS CAN BE OBTAINED FROM THE DESIGN DIVISION.

FABRICATION AND INSTALLATION

REMOVE SHIPPING BOLTS PRIOR TO PLACEMENT OF ELASTOMERIC CONCRETE.

THE EXPANSION JOINT SHALL BE SHOP FABRICATED TO CONFORM TO THE CONTOUR OF THE BRIDGE DECK, BARRIERS, ETC. IT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SUBJECT TO NOTES HEREIN AND THE APPROVAL OF THE ENGINEER.

THE TOP OF THE EXPANSION JOINT DEVICE SHALL BE SET ¼" - ⅜" BELOW THE CONCRETE SLAB (PAVEMENT).

THE STEEL ANCHORAGE FOR STRIP SEAL GLANDS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH SUBSECTION 707.03C.17 OF THE STANDARD SPECIFICATIONS.

THE ELASTOMERIC CONCRETE NOSING SHALL BE DELCRETE ELASTOMERIC CONCRETE.

THE AREA OF THE STEEL ANCHORAGE AND SEALING GLAND WHICH WILL BE IN CONTACT WITH A SEALANT, OR LUBRICANT-ADHESIVE SHALL BE CLEANED WITH TOLUENE OR OTHER APPROVED SOLVENT.

IN THE EVENT THAT SPLICING IS REQUIRED OF THE SEALING GLAND, IT SHALL BE SPLICED BY AN APPROVED METHOD (SUCH AS COLD VULCANIZATION) BY A TRAINED REPRESENTATIVE OF THE MANUFACTURER.

DETAILS AT CURBS OR BARRIERS

THE DETAILS ON THIS SHEET SHOW AN APPROVED MEANS OF TERMINATING THE EXPANSION JOINT DEVICE AT CURBS OR BARRIERS. VARIATIONS OR ALTERNATIVE SCHEMES WILL BE CONSIDERED AND MAY BE USED IF APPROVED BY THE ENGINEER.

MATERIALS

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE EXPANSION JOINT (INCLUDING ELASTOMERIC CONCRETE NOSING) AND THE TERMINAL ASSEMBLIES AT THE CURBS, SIDEWALKS OR BARRIER NOSING AND THE THE PAYMENT FOR THE EXPANSION JOINT DEVICE.

STRUCTURE NUMBER	ANGLE OF CROSSING TO NEAREST 10°	LOCATION OF JOINT	MIN. TOT. TRAVEL ALONG CENTERLINE OF BRIDGE *	REQUIRED LENGTH OF EXPANSION JOINT DEVICE

QUANTITY		
ITEM	UNIT	AMOUNT
Expansion Joint Device	Ft	
Expansion Joint Device, Cover Plate	Ft	

FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)

NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation

NO SCALE

	DATE:	CS:	EXPANSION JOINT DETAILS
	DESIGN UNIT:	JN:	EJ40 (02-10-2016)
FILE:	TSC:		

DRAWING | SHEET: SECT 2

7.01.12 (revised 2-16-2016)

Types of Guardrail Used in Michigan

There are nine standard types of steel beam guardrail in addition to cable barrier found on Michigan highways. The term "Current Use" means "currently proposed for use", not necessarily what may be found existing in the field.

A. Type A (Standard Plan R-60-Series)

Description: W-beam attached directly to posts, Terminal End Shoes on ends. 12'-6" post spacing, 28" height to top of rail.

Current Use:
1. Cul-de-sacs
2. Limited to locations not exposed to through traffic.

B. Type B (Standard Plan R-60-Series)

Description: W-beam guardrail, 8" offset blocks. 6'-3" post spacing, 28" height to top of rail.

Current Use:
1. Basic type for all free access trunklines.
2. On local roads when part of a state trunkline project.

C. Type BD (Standard Plan R-60-Series)

Description: Type B with W-beam on both sides of the post, 8" offset blocks.

Current Use:
1. Limited use in medians on free access highways when median barrier is recommended.

7.01.12 (continued)

D. Type T (Standard Plan R-60-Series)

Description: Offset thrie beam rail, 8" offset blocks, 6'-3" post spacing, 34" height to top of rail.

Current Use:
1. Standard guardrail for new freeway construction (including ramps).
2. Updating existing freeways and ramps when the entire run of guardrail is being removed and replaced.

E. Type TD (Standard Plan R-60-Series)

Description: Similar to Type T except beam elements and offset blocks are installed on both sides of the post.

Current Use:
1. In freeway medians over 30' wide when median barrier is recommended. Used to update existing freeway medians when there is a significant length of guardrail being replaced or where none was constructed initially, but barrier is now recommended.

F. Type MGS-8 (Standard Plan R-60-Series)

Description: W-beam guardrail meeting MASH criteria, 8" offset blocks, standard 6'-3" post spacing, and 31" height to top of rail. Beam element splices occur between standard 6'-3" post spaces.

Current Use:
1. Standard MASH-compliant guardrail for all freeways (including ramps) and free access roadways. After December 31, 2017, it is anticipated that Type MGS guardrail systems will be required for new guardrail installations on all freeways (including ramps) and free access roadways.

7.01.12 (continued)

Types of Guardrail used in Michigan

G. Type MGS-0
(Standard Plan R-60-Series)

Description: W-beam guardrail meeting MASH criteria with no offset blocks, backup plates at all post locations, standard 6'-3" post spacing, and 31" height to top of rail. Beam element splices occur between standard 6'-3" post spaces.

Current Use:

1. MASH-compliant guardrail for all freeways (including ramps) and free access roadways where space is limited and a narrow guardrail system with no offset blocks is desired. MGS-0 should be limited to locations where space is restricted and the installation of a narrow guardrail system with no offset blocks is preferred. After December 31, 2017, it is anticipated that Type MGS guardrail systems will be required for new guardrail installations on all freeways (including ramps) and free access roadways.

H. Type MGS-8D
(Standard Plan R-60-Series)

Description: Type MGS-8 with W-beam guardrail and 8" offset blocks on both sides of the post.

Current Use:

1. In all roadway medians, freeway and free access, when median guardrail is recommended and a MASH-compliant guardrail system is desired. After December 31, 2017, it is anticipated that Type MGS guardrail systems will be required for new guardrail installations on all freeways (including ramps) and free access roadways.

7.01.12 (continued)

I. Type MGS-0D
(Standard Plan R-60-Series)

Description: Type MGS-0 guardrail with W-beam and backup plates on both sides of the post.

Current Use:

1. In all roadway medians, freeway and free access, when a MASH-compliant median guardrail is desired, and where space is limited and a narrow guardrail system with no offset blocks is preferred. Type MGS-0D should be limited to locations where space is restricted and a narrow median guardrail system with no offset blocks is preferred. After December 31, 2017, it is anticipated that Type MGS guardrail systems will be required for new guardrail installations on all freeways (including ramps) and free access roadways.

J. Cable Barrier (See Section 7.01.55C)

Description: Three or four steel cables mounted on steel posts, anchored and tensioned.

Current Use:

1. Medians where crash history indicates cross median crashes and rigid barrier is not warranted.

2. Special situations where up to 90 degree impacts can be expected and larger deflections can be tolerated.

7.01.14 (continued)

Guardrail Surface Finish

C. Corrosion-Resistant Guardrail Replacement Policy

The Engineering Operations Committee, meeting on January 20, 1989, decided that all existing corrosion resistant, or "rusty steel", guardrail encountered on proposed Interstate resurfacing or reconstruction projects should be removed and replaced as part of the project. On projects involving bridges only, the nominal provisions of the approach guardrail anchorage shall be replaced if the rail elements are rusty steel. Where guardrail at the bridge approaches is part of a more extensive installation, the decision to replace will be made on the merits of the specific project. See Section 7.01.44 for upgrading local roads.

7.01.15 (revised 2-15-2016)

Guardrail Terminals

The following guardrail terminal details are in current use for new construction and where specified for updating:

A. Guardrail Approach Terminal, Type 1B (Standard Plan R-61-Series)

Current Use:
1. On approach end of Guardrail, Type B, Type MGS-8, and Type MGS-0, on one-way roadways.
2. On both ends of Guardrail, Type B, Type MGS-8, and Type MGS-0, on two-way roadways.

B. Guardrail Approach Terminal, Type 1T (Standard Plan R-61-Series)

Current Use:
1. On approach end of Guardrail, Type T, on one-way roadways.
2. On both ends of Guardrail, Type T, on two-way roadways.

7.01.15 (continued)

C. Guardrail Approach Terminal, Type 2B (Standard Plan R-62-Series)

Current Use:
1. Same as Type 1B when grading limits prohibit proper offset for Type 1B.

D. Guardrail Approach Terminal, Type 2T (Standard Plan R-62-Series)

Current Use:
1. Same as Type 1T when grading limits prohibit proper offset for Type for 1T.

E. Guardrail Departing Terminal, Type B (Standard Plan R-66-Series)

Current Use:
1. Departing end of Guardrail, Type B, on one-way roadways.
2. Departing end of Guardrail, Type B, on two-way roadways when located outside the clear zone.

F. Guardrail Departing Terminal, Type T (Standard Plan R-66-Series)

Current Use:
1. Departing end of Guardrail, Type T, on one-way roadways.
2. Departing end of Guardrail, Type T, on two-way roadways when located outside the clear zone.

G. Guardrail Departing Terminal, Type MGS (Standard Plan R-66-Series)

Current Use:
1. Departing end of Guardrail, Type MGS-8 and MGS-0, on one-way roadways.
2. Departing end of Guardrail, Type MGS-8 and MGS-0, on two-way roadways when located outside the clear zone.

7.01.16 (revised 2-16-2016)

Guardrail Attachment to Bridges and Walls

The following guardrail anchorage details are in current use for new construction and where specified for upgrading and are detailed on Standard Plans R-67-Series, B-22-Series, B-23-Series:

A. Guardrail Anchorage, Bridge, Detail T-1 (Standard Plan R-67-Series)

Current Use: (Two uses detailed)

1. Use when connecting Guardrail, Type T, Type MGS-8 or Type MGS-0 to Bridge Barrier Railing, Type 4, 2-Tube, 4-Tube, or aesthetic parapet tube without expansion at backwall.
2. Use when connecting Guardrail, Type T, Type MGS-8 or Type MGS-0 to Bridge Barrier Railing, Type 4, 2-Tube, 4-Tube, or aesthetic parapet tube with expansion at backwall.

B. Guardrail Anchorage, Bridge, Detail T-2 (Standard Plan R-67-Series)

Current Use:

1. Use when connecting Guardrail, Type B to Bridge Barrier Railing, Type 4, 2-Tube, 4-Tube, or aesthetic parapet tube without expansion at backwall.

C. Guardrail Anchorage, Bridge, Detail T-3 (Standard Plan R-67-Series)

Current Use:

1. Use when connecting Guardrail, Type B to Bridge Barrier Railing, Type 5 without expansion at backwall.

D. Guardrail Anchorage, Bridge, Detail T-4 (Standard Plan R-67-Series)

Current Use:

1. Use when connecting Guardrail, Type T, Type MGS-8 or Type MGS-0 to Bridge Barrier Railing, Type 5 without expansion at backwall.

7.01.16 (continued)

E. Guardrail Anchorage, Bridge, Detail T-5 (Standard Plan R-67-Series)

Current Use: (Two uses detailed)

1. Use when connecting Guardrail, Type B to Bridge Barrier Railing, Type 4, 2-Tube, 4-Tube, or aesthetic parapet tube with expansion at backwall.
2. Use when connecting Guardrail, Type B to Fillerwalls.

F. Guardrail Anchorage, Bridge, Detail T-6 (Standard Plan R-67-Series)

Current Use:

1. Use when connecting Guardrail, Type T, Type MGS-8 or Type MGS-0 to Fillerwalls.

G. Guardrail Anchorage, Bridge, Detail A-1 (Standard Plans B-22-Series and B-23-Series)

Current Use:

1. Use when connecting Guardrail, Type T, Type MGS-8 or Type MGS-0 to Bridge Railing, Thrie Beam Retrofit.

H. Guardrail Anchorage, Bridge, Detail A-2 (Standard Plans B-22-Series and B-23-Series)

Current Use:

1. Use when connecting Guardrail, Type B to Bridge Railing, Thrie Beam Retrofit.

I. Need for Additional Expansion

The Guardrail Anchorage, Bridge details on Standard Plan R-67-Series will accommodate thermal deck movement up to about 4". If the expected thermal deck movement will exceed 4", the Road designer should consult with the Bridge designer to decide the method for providing the additional expansion required in the guardrail.

CHAPTER 9 UTILITIES INDEX (continued)

9.04.10 (added 2-16-2016)

**Lighting Project –
Energy Rebate Procedure**

Most major energy companies (i.e. Consumers Energy, DTE, Lansing Board of Water and Light, Cloverland Electric) have annual energy reduction incentive rebates. Energy company participation in rebate incentives and contact information can generally be found on their respective websites. Contact the statewide electrical engineer if this information is not found or is unclear.

The amount of the rebate is based on the percent of energy reduced from conversion of existing lighting fixtures to more energy efficient fixtures. New lighting installation projects do not qualify for rebates. The reduction of energy on existing lighting must be determined from utility electric meter KWH readings.

The MDOT or consultant designer initiates the rebate request by verbal contact with the energy company early in the preliminary plan development phase, then subsequently by formal application. Incentives are available on a "first come/first served" basis, until annual funding has been exhausted. Consultant lighting designers must notify the statewide electrical engineer when a rebate incentive has been initiated on behalf of MDOT.

When conversion of lighting fixtures are performed by MDOT forces, the request to the energy company for an incentive rebate is made by the design engineer (either the MDOT statewide electrical engineer or the region designer) during the design and prior to the start of work.

9.04.10 (continued)

The information submitted to the utility company required for the incentive request consists of the lighting plans, utility electric meter numbers, shop drawing submittals of the proposed lighting and the type of existing lighting presently installed.

The utility company then reviews the information and approves the request as submitted to reserve the incentive funds to be awarded once the project is complete. As part of the approval process, the utility company calculates the rebate amount for the qualifying project work from the documentation provided.

Upon completion of the lighting installation, the MDOT statewide electrical engineer requests a final inspection by the utility company of the new lighting installed. Typically, within four to six weeks from the final inspection, MDOT receives the rebate incentive check from the utility company. Forward all rebate checks to the statewide electrical engineer for processing.

7.02.24 (continued)

Joints in Deck Slabs

B. Transverse Joints

1. Construction Joints

   At construction joints where movement is anticipated, an expansion joint device shall be used. Construction joints over piers at fixed bearings are to be a sawed joint 1½" deep by ⅛" wide (minimum) in the top of slab. The joint is to be sawed within 4 hours of removing the curing and is to be filled with Hot-Poured Joint Sealant according to Standard Specification Subsection 914.04. Included in the bid item "Superstructure Concrete, Form, Finish, and Cure, Night Casting." (10-24-2001)(11-28-2011)

2. Expansion Joints

   The maximum single opening in an expansion joint device shall be no more than 4", measured in the direction of traffic. When movement required is greater than 4" a modular expansion joint shall be used. (5-6-99)

   Expansion joint devices shall be installed ¼" to ⅜" below the adjacent deck elevation. This fact shall be taken into account during design. This recess is to prevent damage to the joint from snow plows. (5-6-99) (2-16-2015)

7.02.24 (continued)

The EJ3 Sheet included with the plans will designate the total travel that is required at each joint, measured along the centerline of bridge, and the angle of crossing rounded off to the nearest 10º. The length of the device required at each location will be shown, and these lengths totaled for one bid item, "Expansion Joint Device." The fact that the one item includes several minimum travel requirements should not affect the bid price since we currently find little or no difference when we list minimum travels separately. The EJ4 Sheet shall be used with replacement of existing neoprene expansion joint devices. Use of EJ4 Sheet (device) requires Form 0304 (Proprietary Item Certification (PIC) and Public Interest Finding (PIF)) be filled out and placed in the design folder for Delcrete Elastomeric Concrete (D.S. Brown, 300 East Cherry Street, North Baltimore, OH 45872, Telephone: 419.257.3561). Delcrete is a PIC with "No Equally Suitable Alternative". See section 15.04 and section 11.08 of the Road Design Manual. (11-28-2011) (2-16-2015)

After contract award and before placing the order, the contractor shall inform the Engineer which devices and models they intend to install. The Engineer will provide standard shop drawings of the joint device. (2-16-2015)

When an expansion joint device is used on a sidewalk it shall be fitted with a cover plate as described and detailed in Section 7.02.27 and EJ3 and EJ4 Sheets. (11-28-2011)

7.02.24 (continued)

Joints in Deck Slabs

B. Transverse Joints

1. Construction Joints

   At construction joints where movement is anticipated, an expansion joint device shall be used. Construction joints over piers at fixed bearings are to be a sawed joint 1½" deep by ⅛" wide (minimum) in the top of slab. The joint is to be sawed within 4 hours of removing the curing and is to be filled with Hot-Poured Joint Sealant according to Standard Specification Subsection 914.04. Included in the bid item "Superstructure Concrete, Form, Finish, and Cure, Night Casting." (10-24-2001)(11-28-2011)

2. Expansion Joints

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7.02.24 (continued)

The EJ3 Sheet included with the plans will designate the total travel that is required at each joint, measured along the centerline of bridge, and the angle of crossing rounded off to the nearest 10º. The length of the device required at each location will be shown, and these lengths totaled for one bid item, "Expansion Joint Device." The fact that the one item includes several minimum travel requirements should not affect the bid price since we currently find little or no difference when we list minimum travels separately. The EJ4 Sheet shall be used with replacement of existing neoprene expansion joint devices. Use of EJ4 Sheet (device) requires Form 0304 (Proprietary Item Certification (PIC) and Public Interest Finding (PIF)) be filled out and placed in the project file for Delcrete Elastomeric Concrete (D.S. Brown, 300 East Cherry Street, North Baltimore, OH 45872, Telephone: 419.257.3561). Delcrete is a PIC with "No Equally Suitable Alternative". See section 15.04 and section 11.08 of the Road Design Manual. (8-20-2009) (2-16-2015)

After contract award and before placing the order, the contractor shall inform the Engineer which devices and models they intend to install. The Engineer will provide standard shop drawings of the joint device. (2-16-2015)

When an expansion joint device is used on a sidewalk it shall be fitted with a cover plate as described and detailed in Section 7.02.27 and EJ3 and EJ4 Sheets. (8-20-2009)

8.07.04

Prestressed Concrete I-Beam & Box Beam Notes

A. The contractor shall be responsible for accurately locating the rod connection between box beams. [Use when widening box beam structures.]

B. Prestressing strands shall be given an initial prestress as follows:

0.5" dia. - 31,000 lbs. prestress
0.6" dia. - 44,000 lbs. prestress

(9-18-98)

C. Concrete inserts shall be ¾" diameter; Dayton Superior, Type B-1 Heavy or Type B-18; Williams Form, Type C 12 or Type C -19; Meadow Burke, Type CT-2 or Type CX-4; or equal. Inserts (coil or ferrule) must be electroplate galvanized in accordance with ASTM B633, Service Condition 4. Inserts shall be cast with the beams. Field installation of inserts is not allowed. [Use for I-Beams and spread box beams.] (8-20-2009) (2-16-2016)

D. Concrete inserts for drain casting assembly brackets shall be as called for on Standard Plan B-101-Series. Inserts shall be cast with the beams. Field installation of inserts is not allowed. (9-1-88)

E. End blocks are (required) (optional). [Use for I-Beams.] (9-1-88)

F. Total estimated change of length of bottom flange at transfer of prestress force is ___ ".

G. The estimated beam camber at release is ____". This camber is due to prestress and dead load of the beam only and is measured in the erected position.(8-6-92)

H. During handling and transportation, beams can be supported _____ feet from the end. If two additional strands are draped, the beams can be supported _____ feet from the end. [Use with 70" deep beam and Michigan 1800 beam.]

8.07.04 (continued)

I. The initial force in the transverse post-tensioning tendons shall be _____ lbs. each. [Use for side by side box beams.]

J. Beams in span(s) _____ may be laterally unstable. Precautions shall be taken to insure that beams are not damaged during handling and transportation. [Use when factor of safety for lateral buckling is 1.2 or less.] (8-6-92)

K. Threading of reinforcement and installation into concrete inserts is included in the bid item ("Prest Conc I Beam, Furn, ___ inch") ("Prest Conc Box Beam, Furn, ___ inch"). (12-5-2005)

L. At the contractor's option, Stage 1 and Stage 2 post-tensioning placed at the lower 1/3 point of beams may be separate systems with Stage 2 tendons extending from fascia to fascia. [Use for 33", 39", and 42" box beam decks built using part-width construction.] (8-6-92)

M. Lifting devices shall be removed after beams are erected. Removal is included in the bid item ("Prest Conc I Beam, Erect, _____ inch") ("Prest Conc Deck, _____inch") ("Prest Conc Box Beam, Erect, ____ inch"). (12-5-2005)

N. Use non-deformed steel rods in accordance with AASHTO M 270 Grade 36 and hot-dip galvanized in accordance with AASHTO M 111, as position dowels for precast beams. (11-28-2011)

O. Prestressing strand shall be 0.6" nominal diameter (or 0.5" nominal diameter) meeting the requirements of AASHTO M203 (ASTM A416), Grade 270, low relaxation strand. (9-18-98)

8.07.04 (continued)

Prestressed Concrete I-Beam & Box Beam Notes

P. Any holes cast or formed in the beam shall be filled with non-shrinking grout. Included in the bid item "Prest Conc 1800 Beam, Erect." [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

Q. The outer 6" of the top surface of the beam shall be fabricated to a smooth trowel finish, and then coated with a bond breaker as specified in section 708 of the Standard Specifications. [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

R. At the locations shown on these plans, coat the beams using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating in the manner specified in the Special provision for a distance of _____ feet, starting from the beam end at the joint, coating both sides and bottom of beam. [Use on Prestressed I beam and Spread box beam projects with expansion joints on the bridge. Show the locations to be coated on the erection diagram (new) or on existing General Plan of Structure sheet for existing beams.] (10-24-2001) (11-28-2011)

S. Coat the entire outside and bottom of the fascia beam using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating according to the Special Provision. [Use on Prestressed I beam and spread box beam projects where the beam ends are being coated and where coating fascia beams will not significantly effect the maintaining traffic scheme of the project.] (10-24-2001) (11-28-2011)

T. Steel for sole plates and other bearing components shall meet the requirements of AASHTO M 270 Grade 36. Sole plates are required in all beam ends. (12-5-2005) (11-24-2014)

8.07.04 (continued)

U. Beam steel reinforcement, including stirrups, shall be Grade 60 (ksi). [Use for all I-Beams and all box beams except 17" & 21" box beams.] (12-5-2005) (11-28-2011)

V. Field drilling shall be allowed for sign support anchors only. Location of anchors shall be as detailed on Traffic & Safety Sign Support Special Details. Any damage to the beams shall be repaired at the contractor's expense and approved by the Engineer. (11-28-2011)

W. Items cast into the beams to facilitate bridge construction (forming, finishing, etc.) shall be galvanized or epoxy coated. (8-20-2009) (3-18-2013) (6-17-2013)

X. Concrete inserts shall be 1" diameter; Dayton Superior, Type B-1 Standard or Type B-18; Williams Form, Type C 12; Meadow Burke, Type CT-2; or equal. Inserts (coil or ferrule) must be electroplate galvanized in accordance with ASTM B633, Service Condition 4. Inserts shall be cast with the beams. Field installation of inserts is not allowed. [Use for I-Beams and spread box beams.] (8-20-2009) (2-16-2016)

Y. Adhesive anchors shall use a non-shrink grout (which is cementitious) listed in MDOT's Qualified Products List. [Use for adhesive anchors in sustained, tensile-load-only overhead applications such as traffic signals/sign supports.] (11-28-2011)

Z. Longitudinal beam steel reinforcement (A bars) shall be Grade 60 (ksi). The design of transverse beam steel reinforcement, stirrups and slab ties (ED & D bars) is based on Grade 40 (ksi); the use of either Grade 40 or Grade 60 is allowed in construction of the beam. [Use for 17" & 21" box beams.] (11-28-2011) (11-24-2014)

8.07.04

Prestressed Concrete I-Beam & Box Beam Notes

A. The contractor shall be responsible for accurately locating the rod connection between box beams. [Use when widening box beam structures.]

B. Prestressing strands shall be given an initial prestress as follows:

0.5" dia. - 31,000 lbs. prestress
0.6" dia. - 44,000 lbs. prestress

(9-18-98)

C. Concrete inserts shall be ¾" diameter; Dayton Superior, Type B-1 Heavy or Type B-18; Williams Form, Type C 12 or Type C -19; Meadow Burke, Type CT-2 or Type CX-4; or equal. Inserts (coil or ferrule) must be electroplate galvanized in accordance with ASTM B633, Service Condition 4. Inserts shall be cast with the beams. Field installation of inserts is not allowed. [Use for I-Beams and spread box beams.] (8-20-2009) (2-16-2016)

D. Concrete inserts for drain casting assembly brackets shall be as called for on Standard Plan B-101-Series. Inserts shall be cast with the beams. Field installation of inserts is not allowed. (9-1-88)

E. End blocks are (required) (optional). [Use for I-Beams.] (9-1-88)

F. Total estimated change of length of bottom flange at transfer of prestress force is ___ ".

G. The estimated beam camber at release is ____". This camber is due to prestress and dead load of the beam only and is measured in the erected position.(8-6-92)

H. During handling and transportation, beams can be supported _____ feet from the end. If two additional strands are draped, the beams can be supported _____ feet from the end. [Use with 70" deep beam and Michigan 1800 beam.]

8.07.04 (continued)

I. The initial force in the transverse post-tensioning tendons shall be _____ lbs. each. [Use for side by side box beams.]

J. Beams in span(s) _____ may be laterally unstable. Precautions shall be taken to insure that beams are not damaged during handling and transportation. [Use when factor of safety for lateral buckling is 1.2 or less.] (8-6-92)

K. Threading of reinforcement and installation into concrete inserts is included in the bid item ("Prest Conc I Beam, Furn, ___ inch") ("Prest Conc Box Beam, Furn, ___ inch"). (12-5-2005)

L. At the contractor's option, Stage 1 and Stage 2 post-tensioning placed at the lower 1/3 point of beams may be separate systems with Stage 2 tendons extending from fascia to fascia. [Use for 33", 39", and 42" box beam decks built using part-width construction.] (8-6-92)

M. Lifting devices shall be removed after beams are erected. Removal is included in the bid item ("Prest Conc I Beam, Erect, _____ inch") ("Prest Conc Deck, _____inch") ("Prest Conc Box Beam, Erect, ____ inch"). (12-5-2005)

N. Use non-deformed steel rods in accordance with AASHTO M 270 Grade 36 and hot-dip galvanized in accordance with AASHTO M 111, as position dowels for precast beams. (11-28-2011)

O. Prestressing strand shall be 0.6" nominal diameter (or 0.5" nominal diameter) meeting the requirements of AASHTO M203 (ASTM A416), Grade 270, low relaxation strand. (9-18-98)

8.07.04 (continued)

Prestressed Concrete I-Beam & Box Beam Notes

P. Any holes cast or formed in the beam shall be filled with non-shrinking grout. Included in the bid item "Prest Conc 1800 Beam, Erect." [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

Q. The outer 6" of the top surface of the beam shall be fabricated to a smooth trowel finish, and then coated with a bond breaker as specified in section 708 of the Standard Specifications. [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

R. At the locations shown on these plans, coat the beams using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating in the manner specified in the Special provision for a distance of _____ feet, starting from the beam end at the joint, coating both sides and bottom of beam. [Use on Prestressed I beam and Spread box beam projects with expansion joints on the bridge. Show the locations to be coated on the erection diagram (new) or on existing General Plan of Structure sheet for existing beams.] (8-20-2009)

S. Coat the entire outside and bottom of the fascia beam using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating according to the Special Provision. [Use on Prestressed I beam and spread box beam projects where the beam ends are being coated and where coating fascia beams will not significantly effect the maintaining traffic scheme of the project.] (8-20-2009)

T. Steel for sole plates and other bearing components shall meet the requirements of AASHTO M 270 Grade 36. Sole plates are required in all beam ends.
(12-5-2005) (11-24-2014)

8.07.04 (continued)

U. Beam steel reinforcement, including stirrups, shall be Grade 60 (ksi). [Use for all I-Beams and all box beams except 17" & 21" box beams.]
(12-5-2005) (11-28-2011)

V. Field drilling shall be allowed for sign support anchors only. Location of anchors shall be as detailed on Traffic & Safety Sign Support Special Details. Any damage to the beams shall be repaired at the contractor's expense and approved by the Engineer. (8-20-2009)

W. Items cast into the beams to facilitate bridge construction (forming, finishing, etc.) shall be galvanized or epoxy coated. (8-20-2009) (3-18-2013) (6-17-2013)

X. Concrete inserts shall be 1" diameter; Dayton Superior, Type B-1 Standard or Type B-18; Williams Form, Type C 12; Meadow Burke, Type CT-2; or equal. Inserts (coil or ferrule) must be electroplate galvanized in accordance with ASTM B633, Service Condition 4. Inserts shall be cast with the beams. Field installation of inserts is not allowed. [Use for I-Beams and spread box beams.] (8-20-2009) (2-16-2016)

Y. Adhesive anchors shall use a non-shrink grout (which is cementitious) listed in MDOT's Qualified Products List. [Use for adhesive anchors in sustained, tensile-load-only overhead applications such as traffic signals/sign supports.] (8-20-2009)

Z. Longitudinal beam steel reinforcement (A bars) shall be Grade 60 (ksi). The design of transverse beam steel reinforcement, stirrups and slab ties (ED & D bars) is based on Grade 40 (ksi); the use of either Grade 40 or Grade 60 is allowed in construction of the beam. [Use for 17" & 21" box beams.]
(11-28-2011) (11-24-2014)

8.09.04

Maintenance Painting Notes

A. This bridge is coated with lead based paint. [Existing bridge was built before 1967, has never been repainted, and has the original paint system (i.e. not uncoated A588 steel).] (11-28-2011)

B. This bridge is coated with lead based paint. The structural steel has been blast cleaned prior to coating. The additional effort to clean the structural steel will not be paid for separately but will be considered included in the bid items. [Existing bridge was built between 1967 and 1978, has never been repainted, and has the original paint system (i.e. not uncoated A588 steel).] (11-28-2011)

C. This bridge is coated with a lead based coating system. The structural steel has been blast cleaned prior to coating. The additional effort to clean the structural steel will not be paid for separately but will be considered included in the bid items. [Existing bridge was repainted between 1967 and 1978.] (11-28-2011)

D. This bridge is coated with a zinc based coating system. The structural steel has been blast cleaned prior to coating. The additional effort to clean the structural steel will not be paid for separately but will be considered included in the bid items. [Existing bridge was built after 1978, or was repainted after 1978. It does not have uncoated A588 steel.] (11-28-2011)

E. This bridge has uncoated A588 structural steel. The additional effort to clean the structural steel and the additional coating material required due to excessive surface profile will not be paid for separately but will be considered included in the bid items. [Existing bridge has uncoated A588 steel.] (11-28-2011) (1-23-2012)

8.09.04 (continued)

F. See Subsection 715 of the Standard Specifications for Protection of Work and Environment During the Blast Cleaning of Structures.

G. ___ (conduits) (mains) shall (*not) be cleaned and coated. (*See Subsection 715 of the Standard Specifications.) [*Use for Johns Manville Transite (asbestos) ducts or when protective shielding is requested by the utility company.] (8-6-92)

H. The contractor shall notify each utility company a minimum of three full working days in advance of work impacting that company's conduits or facilities. (11-28-2011)

I. End diaphragms of spans _____ shall be removed to permit proper cleaning and coating. See Subsection 715 of the Standard Specifications. [Use when clearance between end diaphragms and backwall or adjacent diaphragms is 14" or less and the slab above the diaphragms is not to be removed.] (8-6-92)

J. When hanger assemblies are not to be replaced, the existing paint under the link plates shall be protected from damage due to blast cleaning by inserting an approved material around the periphery of the link plates. The material shall be removed prior to coating. (Included in the bid item “Steel Structure, Cleaning, Type 4 (Structure No.)".) (12-5-2005)

K. The Engineer shall inspect the structural steel parts that have been blast cleaned for evidence of cracks or loss of section due to corrosion of more than 25 percent. Such deterioration shall be reported in writing to the Region Bridge Engineer. [Use on all projects with blast cleaning and coating structural steel.] (9-2-2003) (2-16-2016)

L. The estimated area of structural steel to be coated is _____ square feet.

8.09.04

Maintenance Painting Notes

A. This bridge is coated with lead based paint. [Existing bridge was built before 1967, has never been repainted, and has the original paint system (i.e. not uncoated A588 steel).] (8-20-2009)

B. This bridge is coated with lead based paint. The structural steel has been blast cleaned prior to coating. The additional effort to clean the structural steel will not be paid for separately but will be considered included in the bid items. [Existing bridge was built between 1967 and 1978, has never been repainted, and has the original paint system (i.e. not uncoated A588 steel).] (8-20-2009)

C. This bridge is coated with a lead based coating system. The structural steel has been blast cleaned prior to coating. The additional effort to clean the structural steel will not be paid for separately but will be considered included in the bid items. [Existing bridge was repainted between 1967 and 1978.] (8-20-2009)

D. This bridge is coated with a zinc based coating system. The structural steel has been blast cleaned prior to coating. The additional effort to clean the structural steel will not be paid for separately but will be considered included in the bid items. [Existing bridge was built after 1978, or was repainted after 1978. It does not have uncoated A588 steel.] (8-20-2009)

E. This bridge has uncoated A588 structural steel. The additional effort to clean the structural steel and the additional coating material required due to excessive surface profile will not be paid for separately but will be considered included in the bid items. [Existing bridge has uncoated A588 steel.] (8-20-2009) (1-23-2012)

8.09.04 (continued)

F. See Subsection 715 of the Standard Specifications for Protection of Work and Environment During the Blast Cleaning of Structures.

G. ___ (conduits) (mains) shall (*not) be cleaned and coated. (*See Subsection 715 of the Standard Specifications.) [*Use for Johns Manville Transite (asbestos) ducts or when protective shielding is requested by the utility company.] (8-6-92)

H. The contractor shall notify each utility company a minimum of three full working days in advance of work impacting that company's conduits or facilities. (8-20-2009)

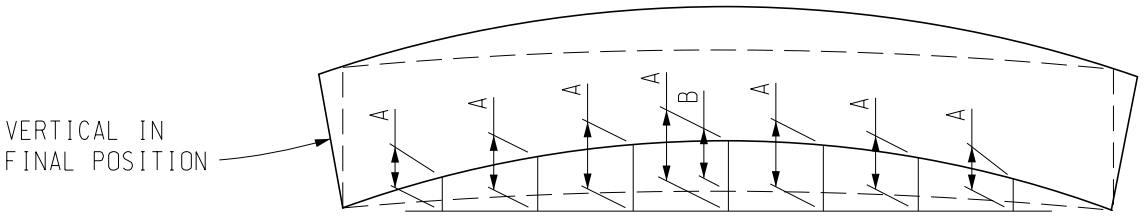
I. End diaphragms of spans _____ shall be removed to permit proper cleaning and coating. See Subsection 715 of the Standard Specifications. [Use when clearance between end diaphragms and backwall or adjacent diaphragms is 14" or less and the slab above the diaphragms is not to be removed.] (8-6-92)

J. When hanger assemblies are not to be replaced, the existing paint under the link plates shall be protected from damage due to blast cleaning by inserting an approved material around the periphery of the link plates. The material shall be removed prior to coating. (Included in the bid item “Steel Structure, Cleaning, Type 4 (Structure No.)".) (12-5-2005)

K. The Engineer shall inspect the structural steel parts that have been blast cleaned for evidence of cracks or loss of section due to corrosion of more than 25 percent. Such deterioration shall be reported in writing to the Region Bridge Engineer. [Use on all projects with blast cleaning and coating structural steel.] (9-2-2003) (2-16-2016)

L. The estimated area of structural steel to be coated is _____ square feet.

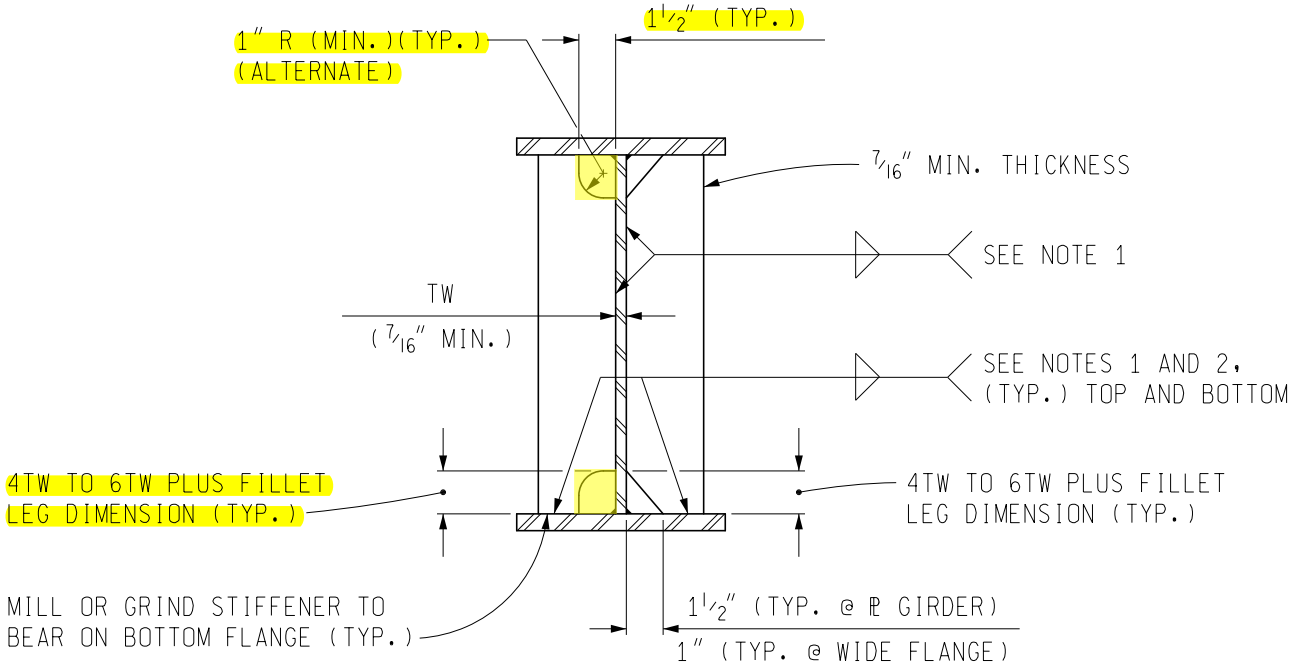
DRAWN BY: BLT CHECKED BY: VZ APPROVED BY: DAJ	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT WELDED GIRDER, CAMBER DIAGRAM AND STIFFENER DETAILS	ISSUED: 02/16/16 SUPERSEDES: 05/04/06



WEBS - CAMBER DIAGRAM

A = TOTAL CAMBER REQUIRED WITH GIRDER LYING ON ITS SIDE. (PROVIDE CAMBER ORDINATES AT A SPACING OF APPROXIMATELY 10'.)

B = DEFLECTION OF ℄ GIRDER DUE TO ITS OWN WEIGHT, CENTER ONLY.



BEARING STIFFENERS

NOTE 1: STOP WELD ¼" SHORT OF CORNER CLIPS
NOTE 2: WRAP WELD AROUND OUTSIDE EDGE

NOTES TO DESIGNER:

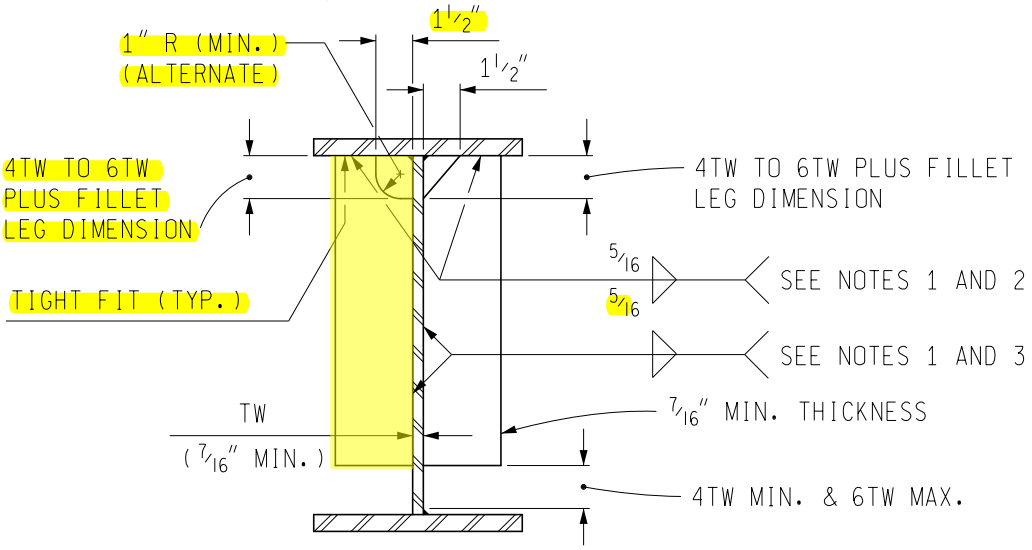
ALL BEARING STIFFENERS, WHETHER FOR PLATE GIRDERS OR ROLLED BEAMS, SIMPLE OR CONTINUOUS, SHALL BE GIVEN THE TREATMENT SHOWN ABOVE.

DESIGNER MUST INSURE THAT THE FATIGUE REQUIREMENTS OF AASHTO ARE MET.

STIFFENER TO WEB WELD MUST TRANSMIT END REACTION TO WEB.

PREPARED BY DESIGN DIVISION	8.06.02

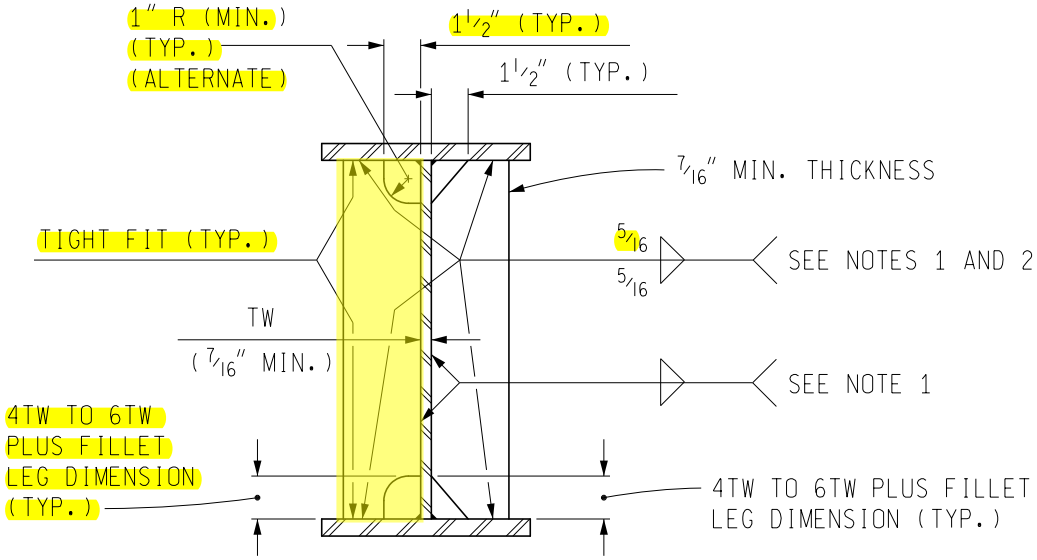
DRAWN BY: BLT CHECKED BY: VZ APPROVED BY: DAJ	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT WELDED GIRDER AND STIFFENER DETAILS	ISSUED: 02/16/16 SUPERSEDES: 05/04/06

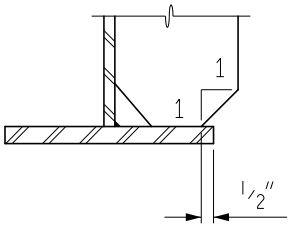


INTERMEDIATE TRANSVERSE STIFFENERS

NOTE 1: STOP WELD 1/4" SHORT OF CORNER CLIP
NOTE 2: WRAP WELD AROUND OUTSIDE EDGE
NOTE 3: WRAP WELD AROUND STIFFENER END NOT WELDED TO FLANGE

NOTES:
WELD TO COMPRESSION FLANGE.
DESIGNER MUST INSURE THAT THE FATIGUE REQUIREMENTS OF AASHTO ARE MET.
EITHER BEVEL OR J COPE HOLES MUST BE USED ON A PARTICULAR PROJECT.





DETAIL A

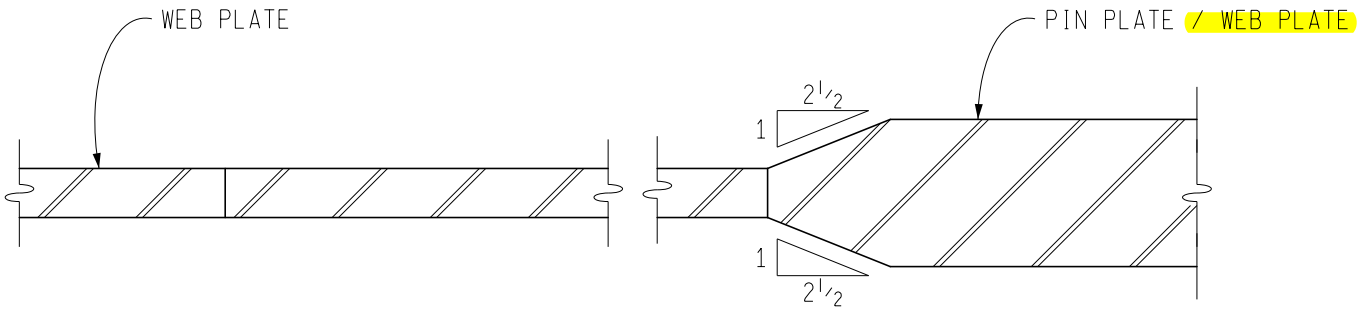
INTERMEDIATE TRANSVERSE STIFFENERS @ CROSSFRAME LOCATIONS

NOTE 1: STOP WELD 1/4" SHORT OF CORNER CLIPS
NOTE 2: WRAP WELD AROUND OUTSIDE EDGE

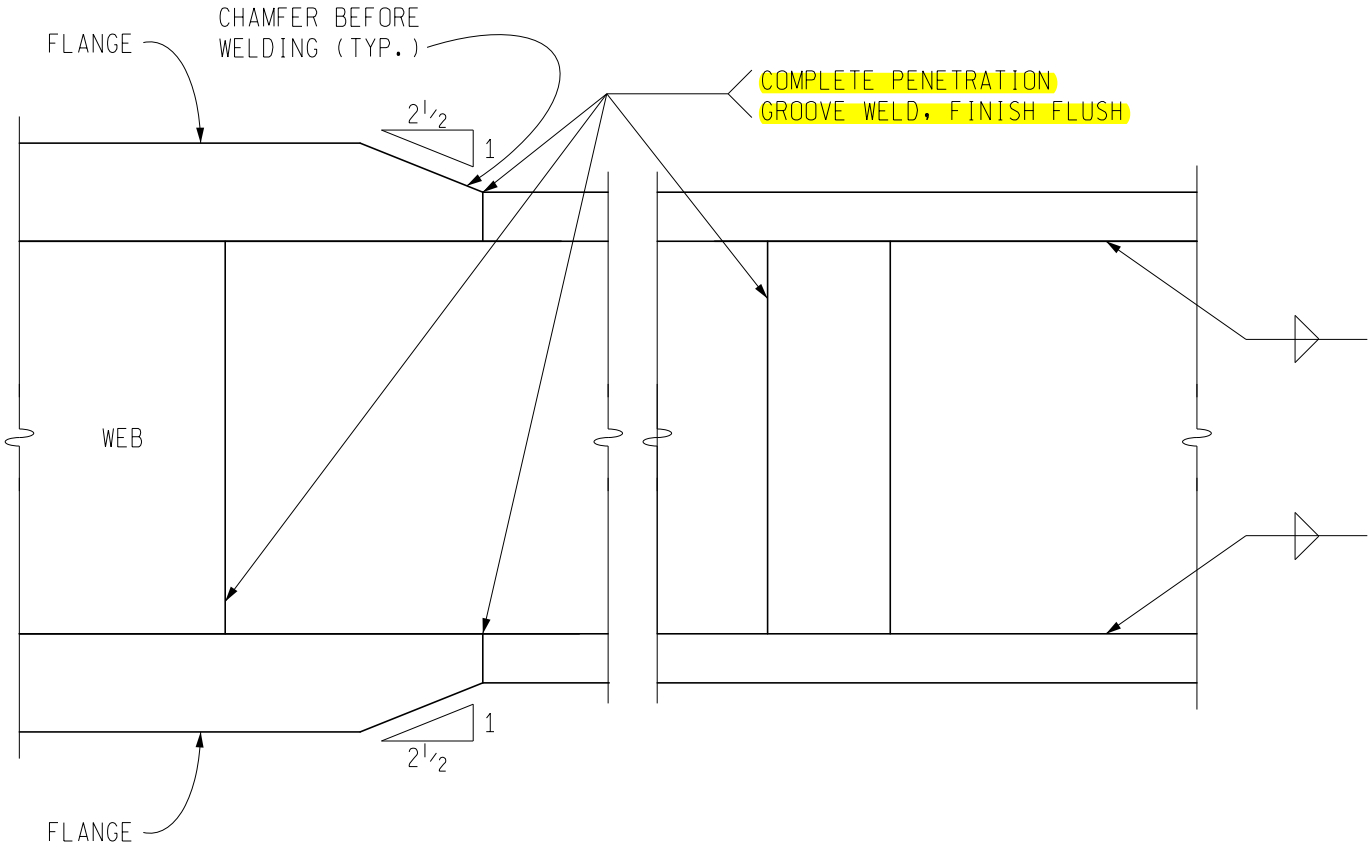
NOTES:
DESIGNER MUST INSURE THAT THE FATIGUE REQUIREMENTS OF AASHTO ARE MET.
USE DETAIL A IF CONNECTION PLATE STIFFENER EXTENDS BEYOND FLANGE.
EITHER BEVEL OR J COPE HOLES MUST BE USED ON A PARTICULAR PROJECT.

PREPARED BY DESIGN DIVISION	8.06.02A

DRAWN BY: BLT CHECKED BY: VZ APPROVED BY: DAJ	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT PLATE GIRDER WELDING DETAILS	ISSUED: 02/16/16 SUPERSEDES: 11/27/01



WEB TRANSITION



WELDED JOINT INFORMATION FOR DESIGN PLANS

CHECKER PLEASE NOTE:

SHOP DRAWINGS MUST SHOW WELD CALLOUTS AND WELD PROCEDURE SPECIFICATION NUMBER IN TAIL.

PREPARED BY DESIGN DIVISION	8.06.03